THE Chemical Age

VOL. LXXIII 8 OCTOBER 1955 No. 1891

Volume LXXIII
Number 1891

The Chemical Age

Established 1919

The Weekly Journal of Chemical Engineering and Industrial Chemistry

BOUVERIE HOUSE · 154 FLEET STREET · LONDON · EC4

Telephone : FLEET STREET 3212 (26 *lines*) *Telegrams :* ALLANGAS · FLEET · LONDON

CONTENTS . 8 OCTOBER 1955

Editor : E. Arnold Running *Publisher & Manager : A. Walsby*

Director : N. B. Livingstone Wallace

MIDLANDS OFFICE :
Daimler House, Paradise Street, Birmingham
Phone : Midland 0784/5

SCOTTISH OFFICE :
116, Hope Street, Glasgow, C.2.
Phone : Central 3954/5

LEEDS OFFICE :
Martins Bank Chambers Park Row, Leeds, 1
Phone : Leeds 22601

SINGLE COPY 1/- (BY POST 1/3) ANNUAL SUBSCRIPTION 42/-

More on Showmanship

WE return to last week's theme of chemical industry publicity—but with a difference. Then criticism was directed at the small scale of the British industry's collective effort, and for reasons of space the exceptionally active publicity of some of the individual companies had to be ignored. There seems as much distinction between these two kinds of publicity—individual and collective—as between similar kinds of research. If progress has been made in developing collective research, much of the credit for this must be given to the Government's leadership and financial support. Not even the most obdurate opponent of State co-operation with industry could deny that the DSIR research association scheme has displayed remarkable catalytic powers. But there can hardly be a similar catalyst for developing collective publicity. One of the major obstacles to forming research associations is the cost of the existent research departments of larger companies. Because of their size, these companies—as prospective members of a research association—must inevitably agree to carry the leonine shares of collective costs. Yet these companies are generally spending very large sums on their own research while the smaller companies may be spending little or nothing. The tendency for a large company not to join in—to say in effect, 'We have already built up our own research organisation and cannot now be expected to pay heavily in building another'—is neither unnatural nor unknown. Indeed, it is probable that if the DSIR research association scheme had started earlier and before many of industry's leading companies had developed their own research programmes, there would today be more collective research associations. These comments are not irrelevant to the theme of publicity. This other field of industrial activity and policy is being developed today by the larger companies with much the same determination that they were applying to research 25 years ago.

Here, to remove risk of misinterpretation, we are not regarding specific product advertising as a form of 'publicity'. Publicity's definition in this context is less precise—the general corporate approach to the public and to different sections of the public, the development of prestige and understanding, the creation of 'background' or 'climate'. It would be invidious to mention names of companies, but there can hardly be any person who would need to be prompted in naming two or three companies in British chemical industry who have, in recent years, devoted a great deal of thought and effort to this broad type of publicity. It is sometimes known as 'house advertising' or 'prestige advertising', but even these neat descriptions have their limitations; advertising, as such, is only one of the tools of this kind of publicity work. Information services for the public and the Press, speeches, lectures, demonstrations, documentary films, participation in conferences, and publications from pamphlets to books, all these means of communica-

tion are utilised in a large company's publicity programme. It is perhaps easier to develop this type of programme for an individual company than for a collective branch of industry. It is certainly easier for a company to assess results and judge if it is obtaining a satisfactory return for expenditure. Nevertheless, these are differences of degree, and certainly not large enough to support an argument that publicity should be left entirely to individual companies, or that collective publicity efforts should only be modest in scale and trivial in cost.

The publicity efforts of larger companies are steadily expanding; and each year sees medium-sized companies suddenly emerging from ancient reticence to tell the public something about themselves as well as about the prices and properties of their products. The longer a similar determination to promote collective publicity is delayed, the more difficult it will become to ensure collective support for its costs. The analogy with research is unmistakable.

At the present time and possibly as long ahead as most sensible people dare to look, it could be urged that any further expenditure upon publicity should be directed overseas rather than at home. This is too narrowly commercial and economic, and it ignores the present-day powers of public opinion and politics at home to regulate industrial activity. Insofar as publicity is judged solely as a climate-creator for selling, however, the point is valid enough. But neither company nor collective publicity need be confined to the boundaries of the home market.

One excellent example of collective publicity abroad is the work of the Swiss watch-making industry here—the British public is constantly kept aware that time measurement is one of Switzerland's old and modern specialisations. A brilliant example of international publicity by an individual company has recently come to hand, a superbly produced book from the Geigy company, '15 Years of Geigy Pest Control'. Although this publication dealt with only one branch of the Geigy company's products, we have yet to see a more impressive publication on the whole range of any British chemical company's products. The pages of this book measured nearly 9½ by 13 inches; there were 150 of them; it was most lavishly provided with photographs; the text was both 'popular' and scientific, a difficult blend for any piece of composite writing to achieve. Nowhere was the commercial note crudely or obviously struck—yet the fullest possible prestige effect was secured by chapters describing the policy of Geigy branded products, Geigy's sales organisation, and Geigy publicity. These chapters followed others that described the story of DDT's discovery and its world-scale development as an agricultural and sanitary insecticide. The scientists who had taken part in these developments were named, an emphatic departure from the anonymous tradition in some company development stories. This introduction of personalities undoubtedly added to reader-interest; it also stressed that the Geigy company is an organisation of people and work and ideas and not merely a capital-powered and profit-oiled machine.

It does not disparage Geigy achievements to say that there are a number of British companies with stories no less important and interesting to tell, or that the British chemical industry as a whole could produce several similar-sized books and still leave more untold than told. The effect of the Geigy publication wherever it goes must be that of increasing respect for Geigy products; there can hardly be a neutral effect or a reverse effect. Surely British publications of the same kind, whether private or collective, would in the long run amply justify their cost? Industrial prestige is a multi-faced coin, especially prestige outside one's own country. To some it may mean consistency of quality; to others it may mean speed of delivery; to others, competitive price; and so on. But prestige should be built by all these factors and not by the one that happens to fit the circumstances of the moment. When a company or an industry presents its story as well as its products, prestige is more likely to be won in that fuller perspective. Provided the products live up to the same standard, the prestige becomes a priceless and enduring form of goodwill. Need we look across the Atlantic or across the Alps to be taught these lessons in publicity?

Notes & Comments

As Others See Us

A SEVEN weeks' tour of Europe's chemical industries might seem too brief for sound judgment, but as experienced an observer as Mr. S. D. Kirkpatrick, Editorial Director of *Chemical Engineering*, can be relied upon to sort out the woods and the trees. His report upon his recent visit (1955, **62** [9], 169-172) is favourably rather than unfavourably critical, particularly of progress made in Britain, Germany, Italy, and Switzerland. In France, Norway, Sweden, and Spain he discerned a somewhat lesser sense of urgency and determination. The rise in chemical industry productivity in this country received special mention and much of this achievement was attributed to the work of the Anglo-American Council on Productivity and the ABCM. Mr. Kirkpatrick (or 'Sid' as he is known in Europe as well as at home) still found evidence here of the 'chemist-plus-engineer' attitude towards chemical engineering, and he obviously regards this as a weak spot; at the same time he also found plenty of evidence of increasing recognition of chemical engineering as a separate branch of the chemical profession. Germany's recovery is described as 'little short of miraculous' with signs that decartelisation, by bringing more internal competition, has in fact speeded development. But in Germany he saw little evidence of change from her old tradition of 'chemist-plus-engineer' combination, the only example of chemical engineering training on the US pattern (the Technische Hochschule at Darmstadt) being cited as an 'outstanding exception'. The ACHEMA Exposition made a vivid impression. It was several times larger than any US chemical exposition. Our own views, as several times expressed in THE CHEMICAL AGE, on the meagreness of British participation would seem to be shared. The importance of trade fairs and expositions in European economy is partly attributed to weakness in other means and facilities for communicating technical information, and in contrast with the American situation this may well be so.

Chasing Rainbows

IF US 'know-how' and equipment has so far been considerably used in Europe's post-war chemical progress —most notably perhaps in the development of the chemicals-from-oil industries in Britain, Italy, and France—this is reported as a dependence that 'will greatly lessen in future' owing to the resurgence in education and research. Mr. Kirkpatrick's review is, on the whole, flattering and he predicts more serious competition in world markets for American chemical products. While greatly respecting his experience and wisdom we cannot completely share his opinions. While appreciating his friendliness we wish we could share his optimism. But, alas, our sales methods still leave much to be desired and lag well behind those of either the United States or Germany. With a few notable exceptions most British chemical companies seem to believe that they can just sit back and wait for overseas business to come to them. We would, moreover, feel much happier if British chemical research concerned itself more with practical problems and left more of the work in pure chemistry to others. This country is essentially a trading nation and at the moment the supply of scientists and money are too limited for her to waste time, energy and money on problems the solutions of which cannot immediately be put to work. At one time honour and glory meant a lot; today our very existence is at stake. What percentage of the important chemical processes being used in our industry is of British origin? In our research institutions how much work ever results in practical application in industry?

The Clean Air Bill

A NATIONAL determination to have cleaner air is already well evidenced by the generally quiet acceptance of the Clean Air Bill's proposals. Smaller

reforms in the past have engendered much louder wails of sectional protest. The most controversial provision in the Bill is the one most likely to affect the chemical industry—the powers and scope of the Alkali, etc., Works Regulation Act Inspectorate will be enlarged, but it is a change that seems flexible rather than precise. The application of this change will be considerably dependent upon Local Authorities' attitudes. It is true that the same thing could be said of all the Bill's provisions, but not to the same degree of flexibility. Some of the major proposals in the Bill are not applicable to works controlled under the older Alkali Act, but smoke emission is now brought into the latter Act's responsibility as well as the emission of noxious or offensive gases. However, this does not exclude such works from charges under the 1936 Public Health Act for smoke nuisance to neighbours or from dark smoke offences under the new Bill; even so, there is a difference, and local authorities will be unable to take proceedings against Alkali Act works unless (in England and Wales) they obtain the consent of the Minister. In effect, this would seem to mean that the Minister would consult the Alkali Inspectorate to find out whether works with technically difficult problems of air pollution control had done all they could to prevent nuisance. It may also mean that tolerance in genuinely difficult cases may be judged in the light of national importance of the works' products. If so, and these points are only conjectural, what is nationally indispensable at one time may at another time be only nationally useful.

Friends, not Enemies

THE Alkali Act Inspectorate has so good a record for co-operation and constructive criticism that these uncertainties should not raise fear or alarm. An opinion poll in the chemical industry would almost certainly rate these officials as friends rather than enemies. The greater trouble in operating this part of the new Bill is likely to arise from Inspectorate staff deficiencies. It has been officially stated that an additional cost of £40,000 per year will be needed to increase the staff, but this would cover only about 52 extra inspectors. This is surely inadequate for their increased duties under the Bill. There is no small risk that relatively untrained, and certainly insufficiently technical, Local Authority inspectors will tend to be used to narrow the man-power gap; this could lead to a high rate of applications for Ministerial consent to take proceedings. Again this is a conjectural point, but it cannot be lightly dismissed unless there is more assurance that there will be enough Alkali Act Inspectors of high technical quality.

Partners In Polythene Plant

PARTNERS in the first large petro-chemical plant which was opened in West Germany on 29 September at Wesselring, between Bonn and Cologne, are the Royal Dutch Shell Group and Badische Anilin und Soda-Fabrik. The plant has a capacity of 6,000 tons a year of polythene, but production can be raised to 10,000 tons.

Refinery gases for the plant are supplied by a nearby refinery which refines oil for Shell. The plant is using the I.C.I. process under licence which formerly was applied only at Badische Anilin und Soda-Fabrik's Ludwigshaven plant where coke-oven gas was the raw material.

Tariff Investigation

An investigation has been instituted by the United States tariff commission to determine whether *p*-aminosalycylic acid and its salts are being imported into the US in such quantities as to cause or threaten serious injury to the domestic industry producing a like or directly competitive material.

Russian Delegation

A delegation led by Mr. Kosygin, a deputy chairman of the Council of Ministers of the USSR, and consisting of Soviet experts from several industries including the chemical industry arrived in this country on 30 September. The visit was arranged at the request of the Soviet authorities and the party is expected to stay about 14 days in the UK. The President of the Board of Trade, Mr. Peter Thorneycroft, received Mr. Kosygin at the Board of Trade on 4 October.

Kentish Terramycin Factory

Pfizer's New Fermentation Plant Officially Opened

AT the ceremony to mark the formal opening of the new fermentation plant for the manufacture of broad spectrum antibiotics at Richborough, near Sandwich, Kent, on 30 September, Mr. John J. Powers, senior vice-president of Chas. Pfizer & Co. Inc., New York, paid tribute to the late Sir Alexander Fleming. His discovery of antibiotics, said Mr. Powers, could never be erased from the annals of human endeavour. Addressing Lady Fleming he said that he hoped that she would regard the plant as part of her distinguished husband's legacy—'as a manifestation of the way in which we lesser men perpetuate the work he initiated'.

Distinguished Gathering

The plant was officially declared open by Lord Brabazon of Tara, P.C., G.B.E., M.C., before a distinguished gathering which included Lady Fleming, Viscountess Astor, Professor H. Burton, Professor F. Bergel, Professor R. Hare, Professor W. Wardlaw, Sir Francis Walsh, Professor H. Berry, Professor F. Dickens, Professor W. H. Linnel, Professor J. P. Todd, Dr. B. K. Kelly, and many others.

Two special trains carried guests down from London and those who stopped over in Folkestone for the banquet which took place in the evening, were accommodated in three of the town's largest hotels.

The plant, which is owned by Pfizer Ltd., the British subsidiary of Mr. Powers' company, cost £2,500,000 and is the largest fermentation plant in Europe producing broad-spectrum antibiotics, the only other British plant being operated by Boots. The chief product will be Terramycin although other tetracylines may be fermented at Sandwich. The capacity of the plant is such that not only can the whole of Britain's demands be met but those of most of the sterling area as well.

Terramycin, or oxytetracycline hydrochloride ($C_{22}H_{24}O_9N_2HCl$), is the product of a micro-organism discovered by Pfizer research chemists in the United States after 134,726 samples of soil from all parts of the world had been examined and after approximately £4,000,000 had been spent on research. The mould found in the sample was labelled *Streptomyces rimosus* and master cultures from this mould were flown to Sandwich from America and are now housed in a sterile room in the new plant. The master culture spores, contained in small ampoules, are kept in a freeze dried state on sand or other suspending material.

To feed the mould, quantities of the necessary nutrients are placed into two dump tanks in the medium preparation room. The medium is then batched up with water and heated ready for sterilisation. When ready it is pumped from the preparation room through to the main fermenters and sterilised with live steam.

The main fermentation tanks, which hold several thousands of gallons of the medium before being seeded with mould spores, are pressurised to exclude all air and any possibility of foreign bacteria entering the vessels. To foster the growth of the mould throughout the entire batch of medium, sterilised air is blown through the mixture while the contents of the tank are constantly agitated. This technique of 'deep-tank' aeration was first

Spare laboratory sterilising equipment at Sandwich

Refining equipment

developed by Pfizer in the early days of penicillin production.

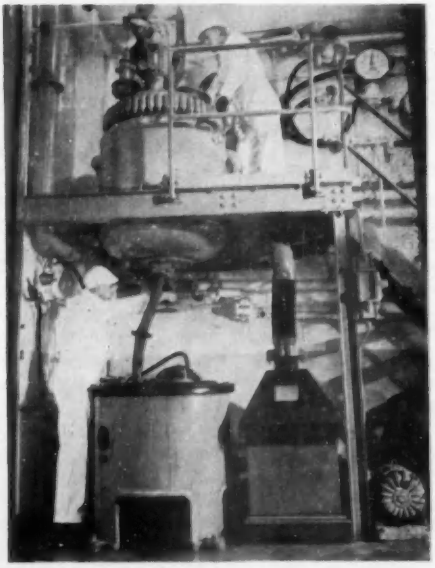
Organisms can generate as much heat as 70 BThU's per hour per gallon and without temperature control the organisms could be destroyed by their own heat within an hour. Hundreds of gallons of water are circulated, therefore, to keep the tanks cool; enough water is circulated daily to supply a town of nearly 100,000 people. Foam must also be combated and an anti-form agent is introduced into the tanks at periods throughout the entire process.

Once the fermentation is complete—the medium exhausted and the mould having expelled the chemical by-product which forms the basis of Terramycin—the clarification process is commenced. The broth, containing mould, the remnants of the medium and highly diluted Terramycin, is fed into holding tanks where it is treated chemically to coagulate the mycelium. It then passes through a stainless steel rotary filter which removes the mycelium and the filtrate is given further chemical treatment to produce an intermediate salt from the active ingredient. This crude material is dried and milled prior to refining.

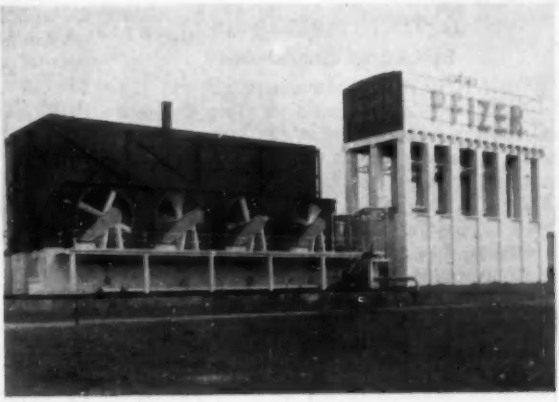
In the refining area the intermediate salt, now ground into a powder, is carried into glass-lined reaction vessels and the solvent added. Insoluble material is filtered, and the antibiotic is crystallised in centrifuges. The precipitate, crude oxytetracycline hydrochloride is washed and vacuum dried. A further dissolving and crystallisation ensures absolute purity.

The plant stands on a site of approximately 80 acres and comprises buildings of 120,000 sq. ft. It contains 32 miles of cable, 33 miles of piping and almost 300 tons of structural steel. Fermentation on a production scale began only nine months after the very beginning of constructional work on the site.

The main contractor for the plant installation was The A.P.V. Co. Ltd., and Mr. F. B. Kern, sales manager of the company's chemical engineering department, took personal charge of the work. Sub-contractors were G. N. Haden & Sons Ltd. (pipework), Barlow & Young Ltd. (electrical services) and Kitson's Insulations Ltd. (lagging).



Final crystallisation of Terramycin

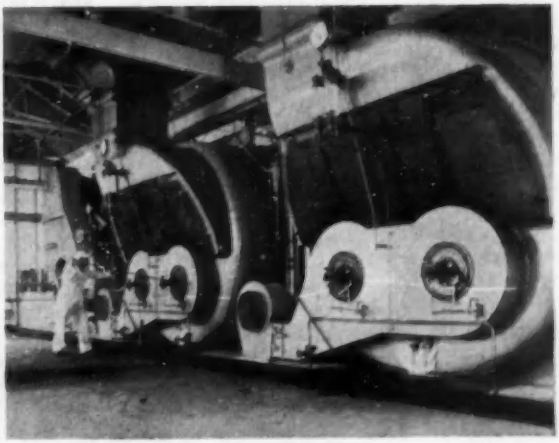


Water cooling towers and head tank

The forced draught cooling towers were supplied by Peter Brotherhood Ltd. and the boilers by Cochrane & Co. (Annan) Ltd. and John Marshall & Co. (Motherwell) Ltd. British Combustion Equipment Ltd. supplied the combustion equipment and the compressors were supplied by Broom & Wade Ltd. The filtration equipment was provided by Dorr-Oliver Co. Ltd., Thomas Broadbent & Sons, Ltd., Edwards & Jones Ltd. and L. A. Mitchell Ltd.

Other main equipment suppliers were: Enamelled Metal Products Ltd. (glass lined and special equipment); Foxboro-Yoxall Ltd. (instruments); Baird & Tatlock (London) Ltd. (laboratory equipment); T. Guisti & Son Ltd. (mild steel equipment); British Labour Pump Co. Ltd., E.C.D. Ltd. and Worthington-Simpson Ltd. (pumps); J. & E. Hall Ltd. (refrigeration plant); Stainless Steel Vessels Ltd. (stainless steel equipment); and Braithwaite & Co. Structural Ltd. (tanks).

Thanking Lord Brabazon for having opened the plant, Mr. John D. Rodgers, director and general manager of Pfizer Ltd., said that the plant meant that Terramycin would no longer cost dollars. Moreover, it would make this antibiotic available to most sterling areas as a British export. The demand for Terramycin was increasing, not only from doctors but from veterinary surgeons and farmers as well. By use of Terramycin as an animal feedingstuff supplement an extra 300,000 acres of British farmland could be freed for other crops. Only 14 tons of the drug would be needed to supply the full needs for the country's pig farmers and the saving in the cost of producing bacon, ham and pork could be £5,000,000.



Inside the boiler house

X-ray Analysis

Invited to Conference

THE Autumn Conference 1955 of the X-ray Analysis Group of The Institute of Physics will be held at the Institution of Civil Engineers, Great George Street, Westminster, London, on 18 and 19 November. Theme of the Conference will be Semi- and Non-Crystalline Materials.

Papers to be read: First day, 'The Mechanism of Crystallite Growth in Carbons,' by Dr. R. Franklin; 'Structural Changes During the Carbonisation of Coal,' by R. Diamond; 'X-ray Examination of Coals and Coal Extracts,' by Dr. L. Cartz, A.Inst.P.; 'Comments on the Structure and Physical Properties of Glass,' by Professor R. W. Douglas, F.Inst.P.; 'The Surface Layer on Ground Quartz,' by Dr. R. L. Gordon, A.Inst.P., O. G. Griffin, G. W. Harris, and Dr. G. Nagelschmid, Ph.D., 'X-ray Diffraction Technique for Liquids,' by Dr. W. May; and 'Espacements "Anormaux" dans l'Hydroxide de Nickel Colloidal,' by Dr. J. Longuet and Dr. J. Mering of the Laboratoire Cental des Services Chimiques.

Second day: 'X-ray Study of a Synthetic Fibre,' by L. Brown, A.Inst.P.; 'An X-ray Examination of Straight Chain Fluorcarbons' by C. W. Bunn, F.Inst.P., and E. R. Howells, Grad.Inst.P.; 'Orientation Phenomena in Synthetic Crystalline Polymers,' by Dr. A. Keller; 'A Classification of Cylindrical Lattices,' by E. J. Whittaker, A.Inst.P.; and 'Long Chain Inorganic Ions,' by Dr. D. E. Corbridge, A.Inst.P.

On the first evening there will be a discourse on 'Crystallography and Phase Rule,' by Professor A. R. Ubbelohde, F.R.S. The Conference is open to all, and one guinea will be charged to non-members of the Institute. Closing date for return of application forms, which should be addressed to the Deputy Secretary, The Institute of Physics, 41 Belgrave Square, London S.W.1, is 15 October.

Glass Technology Scholarships

STUDENTS who have been studying chemistry and physics, and are about to leave school, should be attracted by scholarships in glass technology at the University of Sheffield. The Worshipful Company of Glass-Sellers of London are offering up to four scholarships which in suitable circumstances qualify for supplementation by the Ministry of Education up to the full value of State Scholarships. The scholarship examination consists of papers in chemistry, physics and pure mathematics (two as primary subjects and one as a secondary subject) together with an English language paper.

Applications for entry should be made to the University by 16 January, 1956, accompanied by an entry form and an examination fee of 10s. Entry forms, syllabuses, and further particulars may be obtained from The Registrar, University of Sheffield, Sheffield 10. The examination will begin at the University on 9 April 1956.

Bone Glue Demand In SA

THE URANIUM industry at the gold mines of South Africa has given a tremendous boost to the production of bone glue in the Union due to the use of this commodity as a filter-aid in the uranium extraction process. Residues after gold extraction are re-pulped and mixed with dilute sulphuric acid using compressed air for agitation. When the uranium has been dissolved, the acid-treated pulp is filtered on stainless steel rotary drum filters but the rate of filtration is extremely slow and it is at this point that animal glue is added to speed up filtration.

The sudden increase in the demand for glue created when the first large uranium plants started production led to a shortage and to overcome this, existing glue factories were hastily enlarged and supplies of bones sought all over Southern Africa at a controlled price of £7 per ton. In addition to glue the processing of the bones has yielded valuable phosphate meal and bone grease supplies.

Brazilian Aluminium Expansion

A new plant of the Brazilian Aluminium Co. began production recently at Sorocaba. The company, financed by Brazilian capital, has set output for 1955-56 at 10,000 tons of aluminium ingot, with facilities to increase to 50,000 tons annually within ten years. Electric power is limiting production now, but power facilities under construction will permit an increase up to 10,000 tons. The plant will use bauxite ore from the Pocos de Caldas region of the State of Sao Paulo.

CBMPE Annual Dinner

Sir John Eldridge Principal Guest

ALMOST 900 members of the Council of British Manufacturers of Petroleum Equipment and their guests attended the annual dinner which was held on 29 September at the Dorchester Hotel. Mr. G. V. Sims, managing director of Le Grand, Sutcliff & Gell, Ltd., the chairman of the Council, presided and the principal guest and speaker was Lieut.-General Sir John Eldridge, K.B.E., C.B., D.S.O., M.C., Controller of Munitions, Ministry of Supply.

Proposing the toast, 'The Guests,' Mr. Sims said:

'There are over 400 members of this Council who collectively form a massive pattern of the British engineering and allied industries, collectively engaged in supplying the widest range of equipment needed by the petroleum industry.

'During the first six months of this year, the petroleum industry has placed orders worth £63,000,000 in this country, in the main with members of this Council.

'Briefly, the policy of the Council is to form a bridge between the petroleum industry and its many suppliers. We are at the moment proposing to hold talks at appropriate levels, with a view to finding out from the petroleum industry its current problems regarding supply and informing our members what these problems are and so jointly trying to meet them. We are also planning an informal discussion, which will enable us to make sure that the petroleum industry is fully aware of the research and development going on in the research departments of members interested in the various aspects of metallurgy, especially where these have been carried out for industries other than the petroleum industry.

Too Many Criticisms

'All too many criticisms have been levelled against manufacturers in this country of failing to follow up their products and find out the needs of their customers on the spot. We are doing everything possible to provide information to the members of the Council who intend going abroad and to gather information from those who have returned.'

Proposing the toast, 'The Council,' Sir John Eldridge said:

'This may almost be described as the oil age. Nuclear power is hardly yet with us. At present, oil is perhaps the most concentrated, easily handled and transportable source of power readily available to us. It is available in many forms adapted to many power uses, easily transported and pumped and has lots of energy.

Defence Needs

'In all times, and more so now than ever, sound defence can only be based on a sound industrial economy—and the more powerful and the more widely based the industry of a country is the better is its prospect of having the best weapons and equipment in the quantities and at the time it needs them—both because it has access to better techniques and because the better its economy the more able it is to carry the burden of defence. As our industrial economy flourishes so shall we have a sound defence potential.

'In my position as Controller of Munitions of the Ministry of Supply I am greatly privileged to be allowed to visit many of our industrial firms. I am no technician, and my reactions are those of a member of the Services, but three things have struck me and greatly heartened me:—

'First, the readiness of firms to co-operate with us in the Ministry and help us in our problems, often where no great reward is in prospect. Secondly, the advanced ideas on production which so many firms seem to have. Thirdly, the good relations which appear very generally to exist between management and labour. We, in the Ministry of Supply, need help and are very appreciative of the help we receive.

'We have our own research and development establishments. In my own field we have an Armament Research and Development Establishment, Explosives Research and Development Establishment, Fighting Vehicles Research and Development Establishment, Military Engineering Experimental Establishment, Chemical Defence Experimental Establishment and, of course, there

are others outside of my sphere of influence, the most famous of which is the Royal Aircraft Establishment. But while they are powerful and valuable instruments, they can't do everything. They are bound to specialise to a great extent on work which is not done elsewhere.

'There is so much going on that if we are to start to take advantage of the many advances in materials, in design techniques, and in production methods we must have outside help. And we do get it through our Scientific Advisory Council and its boards and committees and through the many standing and *ad hoc* boards and committees and working parties on which the universities, the great professional institutions and industry help us.

'I would here ask a question. Does industry find any difficulty in getting its designers to do their design work with all production considerations fully in mind?

'I am a non-technical soldier and I am not competent to say how far what I see represents real progress ahead of our competitors. But almost everywhere I go I seem to be shown, with what seems to me justifiable pride, new methods of production or the extension of older methods to larger articles of new machinery. It is obvious that people are looking ahead, though whether it is far enough ahead I am not competent to assess.'

Mr. L. S. Dawson of Oil Well Engineering Co. Ltd., and a member of the Executive Committee, replied briefly.

Pfizer Awarded Cuban Patents

TWO patents on tetracycline, the newest broad-spectrum antibiotic, have been issued to Charles Pfizer & Co. Inc. in Cuba, by the Ministry of Commerce. The patents contain process claims covering the production of tetracycline by direct fermentation, as well as product claims covering the manufacture.

Tetracycline, a discovery of Pfizer research, is marketed under the name Tetracyn. It is finding increasing favour in the medical profession in the treatment of a wide variety of infections.

Pfizer announce that they have instituted legal proceedings in Cuba against E. R. Squibb & Sons Inter-American Corporation for patent infringement, asking for an injunction to prohibit unlicensed sale and distribution of the product. They brought a legal action in January against E. R. Squibb & Sons division of Olin Mathieson Chemical Corporation, Bristol Laboratories, and The Upjohn Company, for infringement of the basic Pfizer US patent on tetracycline.

Course For Plant Engineers

A COMPREHENSIVE refresher course for senior works and plant engineers in London and the Home Counties, sponsored by The Rt. Hon. The Earl of Halsbury (Managing Director of the National Research Development Corporation) is to be held in London this winter at The Royal Empire Society, Northumberland Avenue W.C.2.

The first of its nature to be held in London, it represents the culmination of a series of eight so far held in Britain, all of which have set up enrolment records. It comprises nineteen lectures on Wednesday evenings commencing 2 November, and is organised by the Education Committee of Incorporated Plant Engineers in conjunction with leading industrialists and technical authorities.

The course covers an extensive range of subjects, treated by specialists drawn in the main from industry, and includes: planned maintenance, lubrication, combustion and steam raising (coal and oil firing), space heating, ventilation and air conditioning, steam utilisation, generation of industrial power by process steam, automatic process control, electrical switchgear and factory distribution systems, electrical motive power and control, materials handling, properties and treatment of metals and alloys, compressed air plant and pumping plant.

The fee for the course is four guineas and copies of the syllabus and full particulars may be obtained from the Secretary to the Refresher Course, The Royal Empire Society, Northumberland Avenue, London W.C.2.

Naphthalene Fire

Over a 100 firemen of the Sheffield and Rotherham fire brigades fought a blaze at the works of the United Coke & Chemicals Co. Ltd., at Orgreave on the outskirts of Sheffield, on 29 September, which involved a large stock of naphthalene. After nearly three hours the firemen succeeded in confining the outbreak to one building.

Automatic Control

Joint Conference hears Important Papers

'AUTOMATIC Control in the Process Industries', was the title of a joint conference held on 4 October at Church House, Great Smith Street, London S.W.1. This conference was sponsored by the Society of Instrument Technology Ltd. and the Institution of Chemical Engineers with the aim of bringing about a better understanding between the instrument technologist and the chemical engineer and to encourage the essential co-operation between them in the design and operation of automatically controlled process plants.

At the present state of development it was considered to be better to limit the scope of the conference to discussions of strictly technical problems. At a later date a meeting with wider objects may be arranged, say the organisers.

The demand for places was so great that it became necessary to change the venue of the conference from Caxton Hall, where it was originally to be held, to Church House. In this way it was possible to accommodate 700 British and overseas technologists instead of the 400 originally estimated.

Introducing the conference, Mr. John A. Oriel, President, the Institution of Chemical Engineers, said, 'I am afraid there still lingers in some minds the impression that automatic equipment is a luxury which may or may not be added at some later date. The time has, however, passed when instrumentation could be looked upon as a luxury; nowadays, with most of our plant designed for continuous operation, often at high throughput and at very severe operating conditions, the control is an essential part of the process itself, and the design of the plant is incomplete unless full account has been taken of the instrumentation.'

Small Firms

Mr. Oriel emphasised the necessity for small firms to be fully aware of the value of automatic equipment. The failure to make use of these new developments was often due to lack of knowledge on the part of management, said Mr. Oriel. He hoped that one of the results of the conference would be that a great and fresh interest in this subject would be spread over a wide area of our process industries.

'The Trade Unions', Mr. Oriel continued, 'are even more responsible than management for the tardy introduction of automatic control into the industries of this country; their fear of unemployment as a result of using automatic equipment amounts almost to an industrial disease. If . . . their duty is to increase the pay packets of their members, then they should use every possible means to compel management to install equipment which will improve quality and increase production.'

Empirical Relationship

Mr. Oriel concluded his address by discussing the present knowledge of the relationship between the instrument and the process it has to control. He said that this relationship was largely empirical. 'Every new plant has to have its control equipment designed largely on the basis of rule of thumb. The underlying principles are woefully lacking.' This was even true, he said, in his own industry—the petroleum industry—in which continuous operation and automatic control had been common practice for many years.

It was futile, and perhaps unfair, he said, to expect the universities to make any real contribution to the practical solution of problems in industry as they are and probaby should be, entirely divorced from the industrial world. The universities, and in particular the technical colleges, could help by studying the necessary theories, but the design and development of practical equipment will unquestionably be the work of the industries concerned. 'The real immediate need that I see', said Mr. Oriel, 'is for the easy and ready exchange of information and data which already exist.' 'Is it too much to hope that one outcome of this discussion will be the setting up of a simple centre where there can be a ready exchange?'

At the morning session, presided over by Mr. J. F. Coales, chairman of Control Section, Society of Instrument Technology, three papers were presented.

'The Fundamentals of Automatic Process Control' were discussed by Mr. R. S. Medlock of George Kent Ltd. He described the basic control system, emphasising the importance of the feedback loop. The elements of the loop receive information which they transmit in a modified form dependent upon the characteristics of the elements concerned. The transfiguration of the signal is brought about by distance velocity lags and frequency sensitive elements. According to Mr. Medlock, most chemical plants can be considered to be equivalent to a complex circuit of resistance, capacities and time delays.

Automatic Control System

A complete automatic control system incorporates the plant, whose controlled condition affects the response of a detecting element. This response is measured by a measuring element and compared with the desired value. The difference between the measured and the desired value is called the deviation and this fed into a controlling unit which transmits a control signal to the regulating unit and so provides the necessary correcting condition.

A typical arrangement of control elements is as follows: plant, detecting element, measuring element, controlling unit and regulating unit. Variations can be made in this arrangement, e.g. the regulating unit may be used to control the output from, rather than the input to, the plant.

For the best results from an automatic system the information content transmitted from each unit should be high. In practice the information is invariably degraded. This degradation is sometimes deliberate in the interests of economy or simplicity.

The effects of disturbance vary according to their nature and point of entry into the plants. Particular difficulty arises if the input disturbance is sinusoidal at a period approximately equal to that of the control loop.

Mr. J. McMillan of I.C.I. central instrument laboratory, discussed 'The Dynamics of Process Plant'. The prediction of the dynamic charactistics of a plant, he said, implied a knowledge of the relationships between changes in the process conditions and the response of dependent process conditions, in the form of mathematical expressions, i.e. as transfer functions. The first essential step, therefore, was to set up the differential equation or equations describing the system and from these to derive the transfer function for the process conditions considered.

In the normal design of plant for steady state conditions, concluded Mr. McMillan, many assumptions and approximations were made, mostly justified by checking theory against practical experience. In developing tractable methods for the prediction of dynamic characteristics of plant the need for approximation remained, but the same assumptions and approximations might not be justified. He emphasised that more fundamental data were required before controllability could be considered quantitatively on equal terms with steady state performance criteria.

Two members of the staff of Foxboro-Yoxall, B. W. Balls and A. H. Isaac, discussed 'Automatic Control and Chemical Engineering'.

The basic data for the development of a process plant design are usually a set of limiting conditions for the process variables. Because there may be unknown factors which will influence plant performance, and since variations in supply and operating conditions will occur, this data may be inadequate or even erroneous.

The function of process control, whether manual or automatic, is to make the necessary measurements which are then used to modify the process variables, bringing them to values which must be maintained in order to obtain the required quantity and quality of products.

Narrow View

The decision to apply either manual or automatic control is often based upon economic considerations, for, where labour is cheap and plentiful, a number of variables might be controlled by the process operators. However, to consider automatic control merely as a substitute for manual operation is to take too narrow a view. It has permitted the design of processes which would be too difficult, if not impossible to control by manual means.

The relationship between vessel capacity, liquid level and flow control was analysed quantitatively by Mason and Philbrick (1) who established a set of equations which would permit the following to be calculated:

1. Vessel areas to give desired smoothing of flows.
2. Oscillation periods and magnitudes

which can be tolerated for known dimensions of vessels.

3. Economic balance of instrument costs against equipment costs.

Haigler (2) in 1943 published another paper discussing the relationship between design and controllability.

Notable British contributions in this specialised field have been made in recent years by Farrington (3), (4), whose special requirements emphasised the need for integrating plant design and control theory and Rutherford (5) who has done much to introduce the use of the frequency response technique to the field of process and plant analysis, as well as the evaluation of controller performance.

It should be noted that most of the work and ideas have come from instrument engineers, or those connected with instrumentation or instrument production. The stage has now been reached, however, where the analysis of performance and the fundamental work necessary to evaluate performance factors of process equipment is the task of the chemical engineer.

Chemical Engineers

The responsibility of the chemical engineer is two-fold. He must provide the control engineer with the necessary data on which to base the design of the control system. In addition, he must be conscious of the need for controllability as a design feature in order to obtain satisfactory automatic control in the simplest possible way.

The conventional approach to plant and process design is made in terms of material and heat balances, vessel dimensions, unit plant items and general arrangement assuming balanced or static conditions; whereas for automatic control to be successful design should be related to the dynamic response of the plant. Much of the design data for new projects is derived from laboratory and pilot plant studies, but these methods give scant assistance in the assessment of the dynamic behaviour of the completed design, because of the scale factors employed.

In considering the control system for a plant one of the first steps is to identify the load changes that will occur, their relative magnitudes, and their effects on the operation of the process. These disturbances may arise from many sources, inside or outside the plant. The direction, speed and mode of variation of these upsetting conditions is also important. For example, the deterioration of a heat transfer surface is slow and gradual, always in the same direction. In contrast, changes in steam pressure due to competing demands may occur in a very fast and completely random manner.

After an examination of the disturbances that can occur, attention must be directed to a critical assessment of the design data on which the plant is based. The plant can be maintained under control only when the load changes that occur within the capacity of the plant can be accommodated. Probably the greatest limitation in many process plants arises from the speed rather than the magnitude of load changes. At present it is difficult to estimate these changes in advance but in any event the overall response of the controller is governed by the dynamic response of the plant.

Overall Control

A further stage is to determine appropriate criteria for the overall control of the process on the basis of the individual variables. This amounts to an analysis of the load changes referred to above with reference to their particular effect on the operation of the plant. Generally, a distinction can be drawn between those variables affecting the quality and those affecting the quantity of the product, although these are necessarily inter-related.

General considerations of this type should be the concern of the plant designer because answers to many of these points will be required when the individual control loops for the variables are established, although their details are probably more suitably the concern of the instrument engineer involving as they do the performance and dynamic properties of other elements of the control loop, namely, measuring systems, controllers and regulating units (6).

Care must be exercised in selecting measured variables to initiate control loops so that interaction between loops does not occur. For example, it is unwise to attempt to control two temperatures in a binary, or several temperatures in a multi-component fractionation column, as for a particular feed and one fixed temperature, the column temperature gradient is a function of the plate design and spacing.

An attempt has been made to establish the optimum number of control loops required for the satisfactory performance of a particular process but it is difficult to pursue such an analysis to a definite conclusion (7).

In the initial process design for a particular plant the main considerations are governed by the nature of the feeds, the reactions and the products. Even at this early stage, however, the foundations should be laid for controllability and therefore the success with which the process can be operated under the commonly encountered conditions of load change that have been described.

Reaction Dynamics

One basic influence will be the dynamics of the reaction. For example, the dynamics of a chemical reaction may be well known and understood but may be unfavourable for the purposes of control. Typical of this group is an exothermic batch polymerisation reaction for which the reactants must be heated initially, but as soon as the reaction is established heat must be withdrawn to control the reaction rate.

In many processes physical rather than chemical reactions are carried out. The dynamics of the physical changes are frequently not so well known as those of chemical reactions but are none-the-less important.

In addition to the rates of chemical or physical reaction, the reversibility of the process must be considered. As the performance of an automatic controller is generally described in terms of damped oscillations about the desired value, the assumption is inherent that the process can follow a similar, continuous, wave form. This is the case with units such as evaporators and driers in which only physical changes occur. Where a chemical process has taken place, however, the process may be irreversible. A catalytic oxidation which has been permitted to proceed to the extremes of carbon dioxide and water cannot easily be restored to the desired product!

Automatic control of reactions involving solids is complicated unless the material can be fluidised or handled as a slurry. Examples are the use of milk of lime for the treatment of acid effluents, in preference to solid lime, and the widespread use of pulverised fuel for boilers.

Once the types of reaction that are to be carried out have been decided there is usually a choice of possible processes by which these can be achieved. The choice between batch and fully continuous processes has often to be made and in this connection the effect on controllability is profound. A single automatic controller can control the top temperature of a large distillation tower producing several tons of product per day, but one of each of these same controllers at substantially the same cost per unit will be required on each of a number of batch stills to perform the same duty.

Many industrial processes are semi-continuous and involve intermittent operations in a scheme which is otherwise continuous. For example, in the manufacture of paper, the feed stock is prepared in batches which are fed individually into a subsequently continuous process. With coke ovens, not only are individual ovens fired and pushed at intervals but the firing is transferred periodically to heat alternate sides of the ovens.

It is a common practice in the interests of economy and efficiency of operation, to recycle materials and heat streams within a process. These practices may give rise to serious problems in the control of the final plant. Minor disturbances in a particular variable at an isolated location in the plant may well be fed into another part of the plant and the disturbances amplified.

Careful examination of the flow sheet will serve to show such sources of trouble and a balance must be struck between the operating economics achieved and the difficulty of control that results.

Flow Sheet

The completion of the process design flow sheet will include provision of the necessary corrective streams for regulation of the variables at each stage of the process. These will consist mainly of flows of reactants or products, steam, cooling waters and fuels. The nature and quality of these streams must be considered in relation to the corrective potential that they represent. For example, cooling water to be effective must be at a temperature low enough to provide the required temperature difference across heat transfer surfaces even under adverse conditions. The regulating unit must be correctly sized, taking into account the real nature of the system pressure variations so that even at maximum throughput the automatic control system can still correct for transient changes (8).

The method of regulation may introduce an asymetric plant response which is undesirable for good control. Thus, when temperature control is applied in the region of ambient temperature fast heating can

occur, given an adequate steam supply but cooling, when the temperature exceeds the desired value, is governed by ambient conditions. In these circumstances provision for cooling must be made using a duplex control system.

Translation of the process design into the final plant design is preceded by the stage of mechanical design. At this stage the dynamic view may be lost and poor controllability introduced in consequence.

In any plant there are two principal sources of lag (which are inter-related), namely, capacity and transfer. Capacity may be volumetric hold-up, as in surge drums, distillation column bases as reservoirs for energy such as heat. Transfer lags are due to the significant time factors involved in such cases as the passage of heat through a tube wall or mass transfer operation, e.g. gas scrubbing.

The factors making for a reduction in heat transfer lags are precisely those that make for greater overall efficiency, and, where well designed equipment is used the lags from this source will be of a reasonable magnitude.

Free Access

While the instrument engineer is responsible for specific recommendation and provisions for the detailed items of equiment required, certain points must be observed in the design and layout of both individual vessels and the pipework to allow for the installation and operation of the necessary equipment. Free access to the points on the plant where measurements are made and control valves are installed is essential. In addition to the simplification of routine examinations, the speed and efficiency at which emergency repairs can be carried out is improved. Many automatic controls are so vital to plant operation that any fault developing must be rectified immediately and there is frequently no time to erect stagings and scaffolding.

The precise location of impulse points calls for more than a cursory examination. No purpose is served in controlling the temperature of a column producing pure overhead product from the top as all control potential can then be in one direction only, that of degraded product. The temperature impulse point must be placed where the measurements can vary above and below the desired value and also where the greatest measurement sensitivity in relation to anticipated analysis changes will occur. This point will be decided from an examination of the composition curve, from plate to plate, due allowance being made for re-location of the tapping in case the optimum operating point should be in some other location in the column.

Many Factors

It may be said in conclusion that there are many factors which can be considered in the design stage of a process so that the best use can be made of instrumentation, particularly for complete automatic control of the process. These factors are properly the concern of the chemical engineer who should be prepared also to obtain experimental data on plant controllability so that, eventually, a full synthesis of design and its instrumentation can be achieved. This is considered to be a necessary stage before the introduction of computers based on final product analysis to achieve the stage of full automation.

A total of six papers were presented at the afternoon session, presided over by N. E. Rambush, vice-president, the Institution of Chemical Engineers.

The open hearth furnace and the mill reheating furnace were taken by B. O. Smith of BISRA to exemplify the use of automatic control in the steel industry. He discussed how, in both cases operating variables are noted, together with their effects on each other and on the process. He also indicated how these variables are metered and how the process is regulated to obtain the desired operating conditions. A brief mention was also made of rolling mills where automatic control is likely to be used in the near future.

Whilst in recent years the desirability of continuous processing has been emphasised, there are still many manufacturing operations which can only be carried out by batch processes. The automatic control of such processes was discussed by W. A. Goldstein of Bakelite Ltd. The heart of many batch control systems is the programme controller in one form or another and cam operated and pre-set types were compared and briefly discussed by the author. He forecast that future developments probably lay in the field of automatic analysis of both raw materials and finished products. The output signals from such analytical equipment could probably be used to modify the programme

by the employment of suitable computing equipment.

Savings of the order of 1,000 tons of steam per year have been obtained by applying automatic control to storage tanks of about 3,000 tons capacity held at temperatures around 160°C. These figures were given by W. A. J. Preece in a paper entitled 'The Temperature Control of Large Storage Tanks.' Location of the temperature element, and the heating and cooling characteristics of the system as a whole are of great importance in a successful control loop. If these are given sufficient attention, he said, it has been found possible to save considerable quantities of fuel using very simple control systems.

The applications of instrumentation to the paper-making industry were described in a paper 'Automatic Control in the Pulp and Paper Industry,' by N. C. Underwood of Bowaters Development and Research Limited.

The total investment for process control instrumentation is not always a true criterion on which to balance capital outlay against material earnings said S. W. J. Wallis of The British Petroleum Company in a paper 'The Economics of Process Control.' Present day emphasis on increased production with a current shortage of man-power has necessarily changed the economic picture.

Indications of the way in which process control technique has developed up to the present time were given in a paper 'Development of Modern Control Technique and the Pattern of Future Development,' by A. J. Young of I.C.I.'s Instrument Section. He placed emphasis on the important extent to which the rate of progress depends on the closeness of collaboration between maker, user and research establishment. He also emphasised that the education of the chemical engineer in the basic principles of the subject and his keeping up to date with current improvements in technique were essentials to rapid progress in process control system design.

REFERENCES

(1) Mason, C. E., & Philbrick, G. A., *Trans. Amer. Soc. Mech. Engrs.*, 1941, **63**, 589.
(2) Haigler, E. D., *Chem. Metall. Engrg.*, 1943, **50**, 129.
(3) Farrington, G. H., *Trans. Soc. Instrum. Tech.*, 1947, **1**, 2.
(4) Farrington, G. H., 'Fundamentals of Automatic Control.' Chapman & Hall, London, 1941.
(5) Rutherford, C. I., *Proc. Inst. Mech. Engrs. Lond.*, 1950, **162**, 334.
(6) BS1523, 1945, Section 2, Process Control.
(7) Ruhemann, M., *Trans. Inst. Chem. Engrs.*, 1952, **30**, 125.
(8) Balls, B. W., *Trans. Soc. Instrum. Tech.*, 1953, **5**, 20.

Aid To Diamond Recovery

A NEW use has been found for marine acid oils containing high percentages of crude fatty acids. These oils are formed as by-products during refining operations on the various fish oils produced in South Africa and have hitherto proved somewhat difficult to dispose of as, owing to the fishy odour, they cannot be used as stock for soap manufacture which is the normal outlet for vegetable acid oils.

Now, however, a ready market has been developed as a result of the discovery that these marine acid oils when saponified with caustic soda form a soap solution which is a cheap but effective wetting and flotation medium in washing operations for diamond recovery. The South-West African diamond mines at the Orange River mouth have already used considerable quantities of these acid oils successfully in this manner.

Eighth Technical Exhibition

THE London Section Exhibition Committee of the Oil & Colour Chemists' Association has allocated stands for the 1956 Eighth Technical Exhibition, which will take place on 20, 21 and 22 March, 1956, at the Royal Horticultural Society's New Hall, Greycoat and Elverton Streets, London S.W.1. The committee reports that more requests for stand space had been received than the units available in the New Hall.

As in previous years, the theme of the Exhibition will be the presentation of technical advances in those industries supplying the paint, varnish, printing ink, linoleum and other industries. The technical advances may relate to new products, new knowledge relating to existing products and their uses or, in suitable cases, existing knowledge which is not generally available in the consuming industries.

Chemical Research Laboratory

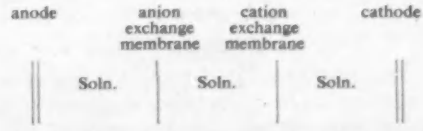
Investigations By Six Groups

THE Chemical Research Laboratory held its annual open days on 27-30 September and visitors from industry, other research establishments and the Press were able to see some of the work being carried out. Of a total staff of 200 there are 45 scientific officers, 75 experimental officers and 30 assistants/scientific, and this research staff is organised into six main research groups, assisted by ancillary services.

The high polymer group is studying ion exchange and other properties of high polymers, application of polymer films as semi-permeable and ion exchange membranes and polymer fractionation.

One of the items demonstrated was the mixed bed deioniser. In conventional methods for deionising solutions the solution is passed through separate beds of cation and anion exchange resins, whereas in the mixed bed process this is done in one stage using a bed consisting of an intimate mixture of a cation and anion exchange resin. Using a strongly acid cation exchange resin and a strongly alkaline anion resin it is possible to produce water that it is as pure as water from a conductivity still.

Another method for purifying water is still in the experimental stage. Cationic membranes can be regarded as insoluble organic polymers to which are attached acid groups, and conversely for anionic membranes. A cell can be constructed consisting of an anode, an anion exchange membrane, a cationic exchange membrane and a cathode. If a saline solution is placed between the two membranes and a current passed through the cell the salt will gradually pass into the anode and cathode compartments.



This method does not produce water of such a high purity as the mixed bed deionisation method but the product is suitable for drinking. For more rapid results it is possible to connect several cells together, either in series or in parallel. A possible limitation of this method is that plentiful supplies of electricity must be available.

The inorganic group is studying the purification by zone melting of certain elements such as bismuth, tellurium and gallium which are needed for research into intermetallic semi-conductors. The purification of metals by zone melting is a recent development due mainly to W. G. Pfann of the Bell Telephone Laboratories. The process consists in moving a narrow melting zone along a metal bar at a slow and constant rate. Any impurity in the metal will distribute itself between the solid and liquid phases and, usually, the concentration of the impurity in the two phases will be different. The impurity will tend to concentrate in the liquid zone and will be moved along with the zone. The molten metal freezing out from the zone will be purer than it originally was. Repetition of the process will concentrate the impurity in a relatively small section at the end of the bar while the remainder will be of high purity.

High Purity Metals

A range of high purity metals is provided as part of the service of the inorganic group. These metals may be divided into three sections: the first section (purity greater than 99.99 per cent) includes Al, Cd, Cu, Ga, In, Ge, Pb, K, Rh, Sn, Wo and Zn; the second (purity between 99.9 and 99.99 per cent) Bi, Co, Ni, Na, Ta and Ti; the third (purity between 99.0 and 99.99 per cent) Sb, Mn, Nb, Va and Z.

The uses of germanium, which is a semiconductor of electricity, were also shown as part of the inorganic group's display. Germanium crystals of a minute size can perform most of the functions of ordinary glass valves. Three main types of these devices have been developed; the germanium diode or point contact rectifier, the power rectifier which can handle over 100 watts, and the transistor which can function as a triode valve.

Germanium has other important properties; light weight, extreme hardness, resist-

ance to corrosion, high electrical resistance and expansion on solidification. Films of the metal are readily produced, while alloys with gold and other metals are also of industrial interest. A glass with a high refractive index can be obtained by using germanium dioxide instead of silica.

On show in the laboratories of the organic group is a mass spectrograph designed by Graham, Harkness and Thode (*J. Sci. Inst.* 1947, **24**, 49). This instrument was made in the laboratories' own workshops.

Among other work being carried out at the laboratory may be mentioned the study of the corrosion of metals under atmospheric, immersed and underground conditions, the collection of industrial bacteria and the study of sulphate reducing bacteria by the microbiology group, and work on extraction and concentration techniques and analytical methods for valuable metals in minerals and ores by the radiochemical group.

Chemicals In SA

Consumption By Gold Mining Industry

FIGURES released by the Transvaal and Orange Free State Chamber of Mines show that the consumption of heavy chemicals and explosives by the South African gold mining industry is steadily increasing. Thus, in the year ending 31 December 1953 the latest statistics reveal that member companies of the Chamber used 21,482,008 lb. of sodium cyanide solution (on 100 per cent NaCN basis) valued at £951,854. More than 80 per cent of the cyanide used was produced in South Africa at plants near Witbank and at Klipspruit.

The mines used more than 2,400,000 cases of explosives mainly of the medium grade (over 50 per cent and up to 74 per cent) during this period. These explosives were all manufactured in the Union and valued at more than £5,000,000.

Lime is used in large quantities and a total of 178,978 short tons valued at £607,726 was consumed in 1953. The various reactions carried out in gold extraction also called for the consumption of other chemicals to a total value of £1,157,630, of which £934,954 worth were made in South Africa. Carbide is another chemical used in large quantities during mining operations and more than 3,000,000 lb. of locally produced carbide valued at £38,572 were consumed during the period under review.

So far, the bulk of consumption of explosives and chemicals has been reported from the older Transvaal mines, but as the new Orange Free State mines are now rapidly coming into operation, a large increase in the demand for these chemicals is bound to occur in the Free State. Provisions of the Atomic Energy Act preclude the supply of information concerning chemicals used in the uranium production process which is now allied to gold mining at many mines.

Phthalic Anhydride

THE MANUFACTURE of synthetic resins of the alkyd type in South Africa will be greatly helped when supplies of phthalic anhydride become available from the new plant now being erected by National Chemical Products at their Germiston factory in the Transvaal. Hitherto all phthalic anhydride had to be imported but the new plant, using local supplies of naphthalene as raw material, will be able to supply the total requirements of the principal resin manufacturing factory in the Union, located at East London and associated with the Transvaal company. A growing demand for alkyd-type resins is being experienced throughout the country especially from the paint and adhesive industries.

The manufacture of aldehydes will also be commenced next year at Germiston so that formaldehyde resins will also be made eventually from local raw materials. Up to the present National Chemical Products have been chiefly noted for the range of industrial solvents derived from fermentation processes which they manufacture. They also control a subsidiary company at Durban, Umgeni Distilleries Limited, which specialises in supplies of industrial alcohol from cane fermentation.

To Build Sulphur Factory

The NV Abimaju Trading Co. plans to build a sulphur factory at Wonosobo, Indonesia. Before the war sulphur was mined in the Dieng Plateau by foreign enterprises. Recent surveys have revealed that there is some 150,000 tons of sulphur in the Dieng Plateau.

Analysis of m- and p-Cresol Mixtures

Report from US Naval Research Laboratory

A METHOD has been devised by the US Naval Research Laboratory, Anacostia Station, Washington DC, for the accurate analysis of mixtures of *m*-cresol and *p*-cresol from freezing point data. It has also been shown that this new method works in the presence of guaiacol, which is previously determined by the Zeisel methoxy method. The report, entitled 'A Procedure for the Estimation of *m*- and *p*-cresols in their Binary Mixture and in Ternary Mixture with Guaiacol', is by S. L. Dinsmore, and a copy can be loaned from TIDU, Cunard Building, 15 Regent Street, London S.W.1.

Following is an abridged version of the paper:—

Cresylic acid, the fraction of alkali-soluble tar distilling between 175°C and 230°C (760 mm.) has commonly the following components: phenol, the three isomeric cresols, and isomeric xylenols, and some higher phenols, phenol and the three cresols being the most significant products. The fact that three of these four important components are isomerides and are a homologue of the fourth makes for a great similarity of chemical and physical properties, and narrows considerably the means of separation and estimation. The important physical properties of these so-called tar acids are:

TABLE I

Properties of the Coal Tar Acids

Pure Component	b p (° C)	m p (° C)	
phenol	181	42	1.5390
o-cresol	190	31	1.5350
m-cresol	202.2	11	1.5305
p-cresol	202.5	34.5	1.5290
xylenols	209-225	—	—

The boiling point differences are such that by distillation it is possible to separate the following four fractions to the extent of 98 per cent or better: (1) phenol, (2) *o*-cresol, (3) *m*- and *p*-cresols, and (4) xylenols. Discounting the xylenols, the only analysis remaining is that of the binary mixture of *m*- and *p*-cresols.

Numerous chemical methods have been proposed for estimating the *m*- and *p*-compositions of a binary mixture, such as sulphonation, followed by fractional steam distillation of the *m*- and *p*-cresol sulphonic acids, selective nitration of the *m*-cresol (by Raschig), and the formation of unique addition compounds by one of the two cresols, *m*-cresol with urea, *p*-cresol with oxalic acid, thereby permitting their separation.

All these methods are quite unsatisfactory as analytical methods, particularly for routine work, where rapidity and a minimum of operations are desirable. In addition to lacking the necessary precision, they are so involved and laborious that the analysis of one binary sample by any of them would require one or two days' work.

Melting Point Data

One striking difference in the physical properties of *m*- and *p*-cresols is in their melting-points. Dawson and Montford (1) obtained accurate melting point data for various binary mixtures of *m*- and *p*-cresols, and from this data constructed the melting-point as a function of the *p*-cresol content of the mixture. They then were able to use the melting point of such a mixture as an index of its composition, by reference to their curve of melting-point data for known mixtures.

The investigation and work done at the Naval Research Laboratory was two-fold in purpose:—

(a) Construction of an accurate freezing-point curve for a range of binary mixtures made from pure *m*- and *p*-cresols, and verification of the fact that the freezing-point correctly indicates the *m*-*p*-cresol composition.

(b) Development of a freezing-point technique giving wholly reliable determinations of the desired precision (0.05° C) and at the same time being as simple and rapid in operation as possible without impairment of this dependability and accuracy.

The additional problem of analysing correctly for *m*- and *p*-cresols in mixtures containing guaiacol was encountered, and it was shown that on a molar basis guaiacol is precisely equal in effect to *m*-cresol with respect to the freezing-point of mixtures with *p*-cresol, so that the *m*-*p*-cresol analysis by freezing-point data is still valid, the separate estimation of the guaiacol by other means providing sufficient additional information for calculation of the *m*- and *p*-cresol contents from freezing-point data.

The method of analysis presented in the report for the estimation of the *m*- and *p*-cresol contents in binary mixtures is fundamentally the method originated and described by Dawson and Montford (1), namely: The use of the melting-point of the mixture as an index of its composition, arrived at by reference to previously determined melting-point data for known mixtures.

The one significant change in technique in the present work, making for increased simplicity and speed, is the taking of freezing-points rather than melting-points. The latter determinations require greater time and care, and offer no advantage of any sort over freezing-point determinations. The freezing-point technique is not only much more simple and rapid in operation, but it also gives results that are possibly more reliable. In addition, the freezing-point curve is a straight line and so is more readily determined than the melting-point curve, which is not straight.

Apparatus

The necessary apparatus consists of the following equipment:—

(a) The freezing-point tube—a 22 by 110 mm. glass test-tube.

(b) The thermometer—a mercury thermometer graduated from 0°C to 50°C in tenths of a degree.

(c) The stirring device—a thin, solid glass rod, with the stirring end bent into a circle is entirely adequate; the stirrer is operated by hand.

(d) The cooling bath—a large test-tube or beaker filled with water can be used, but a transparent Dewar bottle is a much better container.

The procedure of the analysis is as follows: The sample for freezing-point determination is put into the test-tube, no more sample than enough to cover the bulb of the thermometer resting in the tube being necessary; the tube is placed in the cooling bath (of cold water at about 15°C), and the sample is vigorously stirred.

If solidification does not occur when the sample has become fairly viscous, a crystal of *p*-cresol is added to start crystallisation, which will be rapid if the sample has been supercooled. In this case, the temperature will not usually be the true freezing point (the maximum temperature at which solidification occurs), but this preliminary result will enable the analyst to adjust the water in the cooling bath to a temperature only about two degrees lower than the true freezing-point.

The freezing-point tube is then warmed slowly—by being held in the hand—until only a few crystals remain unmelted. The tube is now cooled slowly by the bath, which has been adjusted to a temperature not more than two degrees cooler than the correct freezing-point, and the sample is vigorously stirred. Because of the few undissolved crystals present, the freezing will occur this time with only slight supercooling, and the thermometer will be able to register the maximum temperature rise. The stirring must not cease until, due to cooling by the bath, the temperature begins to fall. The maximum temperature registered during the freezing is the freezing-point.

The sample should again be melted by hand warmth and the freezing-point determination repeated, with a cooling bath even closer to the maximum freezing temperature. With the proper technique, determinations on the same sample should check as closely as 0.05°C on a thermometer graduated in tenths.

While the simple procedure just presented is thoroughly reliable and entirely adequate for correct freezing-point determination, it must be emphasised that the proper technique and attention to details are essential for good results. The procedure presented above of making a preliminary cooling for the purpose of obtaining seed crystals eliminates the major difficulty of supercooling during the freezing-point determination.

The following table (II) gives the freezing-point data for a series of *m*- and *p*-cresol mixtures, determined by the method presented in the preceding section.

TABLE II

per cent of p-cresol (in meta-para-cresol mixture)	*Freezing-point* (°C)
100% (*p-cresol* alone)	34.35
94%	29.65
90%	26.60
88%	25.30
86%	23.75
82%	20.70

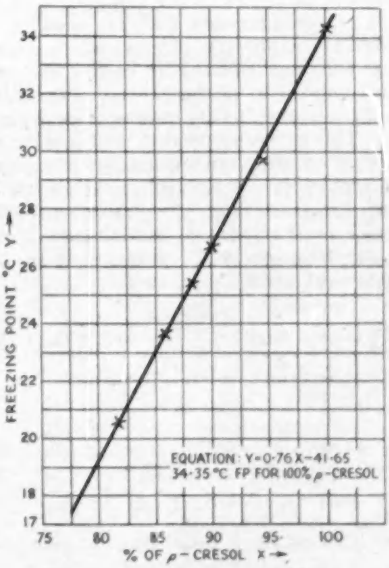
m-cresol (alone) freezes at 10.8.

The curve of these data constructed as freezing-points against percentage of *p*-cresol is given on the accompanying graph. It is seen that the curve is a perfectly straight line; its equation is $Y = 0.7600X - 41.65$, where Y equals

the freezing-point and X equals the percentage of *p*-cresol in the mixture. (This curve does not exactly check with the mp. curve of Dawson and Montford (**1**), their curve being convex upwards.)

The composition of a mixture consisting solely of *m*- and *p*-cresols is known as soon as its freezing-point is known, since by the curve shown the freezing-point is correlated directly with the percentage *p*-cresol in the mixture; the difference of the percentage *p*-cresol from 100 per cent is the percentage of *m*-cresol. However, this direct approach is not feasible for mixtures containing much more than 20 per cent *m*-cresol, and therefore melting much below 20°C, the low end of the freezing-point curve in the graph. The curve has not been extended lower because of the difficulty of determining at room temperature with an accuracy of 0.05°C freezing-points much below 20°C. This is particularly so because the maximum freezing temperature is shorter lived as the *p*-cresol content decreases, and is quite short lived for *p*-cresol contents much below 80 per cent.

Consequently, for mixtures having more than 20 per cent *m*-cresol, and therefore freezing below the low end (19°C) of the curve, the following procedure of analysis is resorted to: enough pure *p*-cresol is added to the unknown sample to raise the freezing-point of the new mixture to some point on the curve (that is, above 19°C). From the final freezing-point the final composition is obtained, and from the amount of pure *p*-cresol added to the known amount of original sample, both having been weighed to 1 mg., the composition of the original sample is readily calculated.



Graph of freezing point against percentage of p-cresol

Simple Correction

It is important to note one fact: the freezing-point of the *p*-cresol on hand may not be 34.35°C, corresponding to 100.0 per cent *p*-cresol on the pre-determined freezing-point curve. If the *p*-cresol freezes between 34.0°C and 34.5°C, correct results can be obtained merely by adding to or subtracting from, as the case may be, the difference between the freezing-point of the *p*-cresol used and the freezing-point (34.35°C) upon which the correlation curve is constructed. In all cases this simple correction gives the correct results.

The best results will be obtained if the composition of the mixture taken is between 83 per cent and 93 per cent. Consequently, *p*-cresol should always be added to samples freezing lower than 20°C or 21°C, and the analysis of the original sample obtained by calculation rather than attempting lower freezing-point determinations and extrapolating the straight line freezing-point curve to obtain the composition.

An upper limit of 93 per cent *p*-cresol is suggested for low freezing mixtures because the more *p*-cresol that is added to the mixture the more an error in the analysis is magnified with respect to the original *m*- and *p*-cresol composition.

Guaiacol is a component of the *m*- and *p*-cresol fraction from wood tar distillates and is inseparable from the cresols by fractional distillation (guaiacol boils at 205°C, *p*-cresol at 202.5°C, and *m*-cresol at 202.2°C). Guaiacol can be estimated (quantitatively) in this mixture by the Zeisel methoxy analysis, in which hydriodic acid is used to cleave the other group of the guaiacol (*o*-methoxy phenol) (**2**). A means of estimation of the *m*- and *p*-cresol contents in this ternary mixture without separation from the guaiacol is desired.

No previous attempt to solve this problem seems to have been made. Since phenol and *o*-cresol as well as *m*-cresol decrease in a regular way the freezing point of *p*-cresol in proportion to their concentration in binary mixtures with it, the logical attack was to determine what effect guaiacol mixed in various proportions with *p*-cresol would have on the freezing-point of the resulting mixtures.

When mixtures of guaiacol and *p*-cresol are made up in the range from 80 per cent to 100 per cent *p*-cresol and the freezing-points are found, these data plotted as freezing-point/weight per cent of *p*-cresol are seen to lie on a straight line above the straight-line curve for *m*-*p*-cresol mixtures. The slopes of these two lines are such that it appears that guaiacol is only about 0.863 as effective as an equal weight of *m*-cresol in lowering the freezing-point of *p*-cresol. This factor 0.863 is almost exactly the ratio of the molecular weight of *m*-cresol to that of guaiacol, and consequently guaiacol effects the same lowering of the *p*-cresol freezing-point as *m*-cresol does, mol for mol. Therefore, if for the above-mentioned guaiacol-*p*-cresol mixtures the percentage of *p*-cresol is calculated on a molar basis—by multiplying the weight of guaiacol by 0.863 (thereby expressing it as its equivalent weight of *m*-cresol) and using this modified 'weight' in calculation of the percentage composition of the mixture—the guaiacol-*p*-cresol data, now expressed as freezing-point/mol per cent *p*-cresol, lie precisely on the *m*-*p*-cresol curve, as Table III shows.

It is evident that columns (2) and (4) correspond well (while (1) and (4) do not), which shows that, on a molar basis, guaiacol is exactly equivalent to *m*-cresol in terms of freezing-point lowering of *p*-cresol. Therefore, the *m*-*p*-cresol curve can be used for the correct analysis of guaiacol-*p*-cresol mixtures, the results being in terms of mol per cent from which the composition in weight per cent can be calculated.

The experimental results show that the presence of guaiacol does not invalidate the estimation of *m*- and *p*-cresols from freezing-point data, since the guaiacol simply influences the freezing-point as an equivalent (molar) amount of meta-cresol, and consequently shows up as such in the resulting analysis. The freezing-point indicates the mol per cent *p*-cresol in the mixture; the difference of this value from 100 per cent is the sum of the mol per cent of guaiacol and *m*-cresol present, i.e., the 'total equivalent *m*-cresol' content (in mol per cent). The guaiacol composition is determined separately by Zeisel methoxy analysis. This weight percentage value for the guaiacol composition is multiplied by 0.863 to express it as mol per cent, i.e., in terms of its equivalent amount of *m*-cresol.

It is believed that there has been developed an accurate yet very rapid and simple method for analysing mixtures of *m*- and *p*-cresols and such mixtures containing guaiacol. The freezing-point of the mixture is shown to be a reliable index of *p*-cresol concentration.

The very simple and rapid procedure of freezing-point determination presented is entirely adequate and reliable for determinations correct and reproducible within 0.05°C.

It is recommended that this method be used for the analysis of appropriate cresylic acid fractions when it is desired to know the composition of the mixture with respect to the isomeric *m*- and *p*-cresols (and guaiacol). This procedure should lend itself to the control of the composition of cresols for antiseptics, or raw material for the manufacture of plasticisers, for cable insulating stocks or synthetics. It has already proved to be of value in the exploration of new sources of phenol and cresols.

REFERENCES

(1) Dawson & Montford, *J. Chem. Soc.*, 1918, 113, 935.
(2) Scott, 'Handbook of Analysis,' Vol. II.

TABLE III

Composition of Mixture	(1) *Weight per cent of p-cresol*	(2) *Mol per cent of of p-cresol*	(3) *Freezing-Point (°C)*	(4) *Corr. per cent p-cresol on m-p-cresol curve*
0.4101 gm. guaiacol	91.8%	92.9%	28.70°	92.5%
4.6033 gm. *p*-cresol				
0.6075 gm. guaiacol	87.9%	98.4%	26.25°	89.3%
4.4117 gm. *p*-cresol				
0.8111 gm. guaiacol	83.8%	85.7%	23.35°	85.5%
4.1968 gm. *p*-cresol				
1.0148 gm. gauiacol	79.5%	82.0%	21.00°	82.5%
3.9941 gm. *p*-cresol				

Documentation of Molecular Spectroscopy

New Infra-Red Raman Spectra System

THE question of documenting and publishing the work of spectroscopists has been much discussed in recent years. A number of systems, all using punched cards, and all documenting spectra in the infra-red range, have now been published. The publication of the new system of documenting infra-red Raman spectra is announced jointly by Butterworths Scientific Publications, London, and Verlag Chemie, Weinheim/Bergstrasse, Germany. The new system (DMS) claims the following advantages over those previously published:—

It combines a survey of current literature (i.e., an abstracting service) with an expanding collection of selected spectra of purified substances, of interest in many fields of chemistry, and is suitable for the smaller laboratory possessing no sorting machine. It also offers a complete classification of organic substances which enables all organic and inorganic compounds to be included, and incorporates a large amount of data on single cards from which answers may be obtained to a wide variety of questions required in research.

Method of Sorting

The system consists of a set of cards punched with a double row of holes on all four edges. By leaving some perforations uncut and cutting others into slots according to the code devised, the cards can be sorted manually by the use of a steel needle. If sorted negatively, the selected cards drop from the pack. The spacing between the perforations on the edges of the cards conforms to other international sizes, so that the cards can be sorted by any of the usual sorting machines. There are two identical editions, in English and in German.

The literature cards contain abstracts of papers relevant to molecular spectroscopy which appear in the literature. The name of the author(s), name and reference to the journal in which the paper appeared, the spectral region studied, the content of the paper as an abstract and such special problems as apparatus, technique and theory as are mentioned in the paper abstracted. This information is coded on to the perforations on the card to permit selection. It is, in effect, an indexed abstract.

A spectra card is published for every substance of which a spectrum of satisfactory quality has been described. The spectral diagrams will be obtained not only from published papers, but also from measurements taken in various European laboratories (academic, commercial and Governmental) and not yet published. Each diagram will be chosen critically as being the best available. The spectral diagram will be reproduced in a linear wave-number scale from 200-4,000 cm^{-1}, with a reduced scale (1:4) from 2,000 to 4,000 cm^{-1}, but the non-linear wave-length scale is also printed on the cards.

Considerable Information Given

In addition to the spectral diagram, the card also shows the structural formula, physical constants, Beilstein reference and other data relating to the substance examined. The main absorption bands are coded on the edges.

Important feature of this spectra card, apart from the spectral diagram, is the coded classification of substances printed on the spectra card. No separate book index is necessary since the substances are classified by a molecular structural system on the card. Briefly, this system regards the molecule as being built up from structural units, rings, chains, double bonds, etc., and functional groups, and symbols to indicate these are printed on the card, and coded on the perforated edge.

To Start in 1956

It is expected to start the DMS Service in 1956 with an initial batch of about 500 cards, and to issue about 2,000 cards in the first year of operation. It is also expected that this figure of about 2,000 cards annually will be maintained, the proportions being roughly 20 per cent literature cards and 80 per cent spectra cards. The substances to be examined have been carefully selected so as to cover a very wide range which will satisfy the requirements of both academic and industrial users in different applied fields.

Sasol Tests Commence

Early Start Forecast

TESTS are soon to begin in the converters at Sasol to transform gas into oil and the first Sasol petrol would come on to the market in October if everything went well, said the chairman of the Industrial Development Corporation at a recent speech in Johannsburg.

No Sasol petrol had yet been made. Tests in the converters did not mean that petrol would be produced immediately. Sasol's role in the economic structure of the Union must be understood. It was not there only to provide fuel, but was also a chemical factory which laid the foundation for a synthetic industry in the Union on a massive scale. Not only would this industry be able to provide a great variety of products which had at present to be imported, but enough goods for export at a total value which, over a number of years, might well be greater than the present value of gold production. South African coal had the great advantage of being cheap.

'Consequently, blessed with such great advantages of cheap raw material, and with the impetus and facilities which Sasol affords, there is every reason to expect that South Africa will become one of the big factories in this chemical age'. In other respects Sasol was the natural link between the chemical industries in the Union.

One important product now being made was ammonia. By producing ammonium sulphate Sasol had made an important contribution to food production. He said that the production of petrol would absorb about two-thirds of Sasol's capacity. For strategic reasons alone this was important. It would have been much more profitable for Sasol to devote itself to the production of chemicals, but it was essential for South Africa to be able to provide for herself in time of need.

Pesticides Merger

AMALGAMATION of the pesticides operations of Canadian Industries (1954) Ltd. and Chipman Chemicals Ltd., manufacturers of pesticides in eastern and western Canada, respectively, will take place within the next few months. Fifty per cent of the shares in a joint company, to be known as Chipman Ltd. will be held by CIL and 50 per cent by Chipman. The head office of the new company will be in Montreal, and four plants will be located at Buckingham, Quebec, Hamilton, Ontario, Winnipeg, Manitoba, and Moose Jaw, Saskatchewan.

The amalgamation unites two organisations which have had long experience with pesticides in Canada. Chipman introduced chlorate weed killers, notably 'Atlacide,' in 1926 while CIL introduced the first mercurial seed dressing in 1933.

Chipman Ltd. will have behind it the extensive research resources of I.C.I. Ltd., and Plant Protection Ltd., of the United Kingdom, and of Chipman Chemical Company Inc. of the US.

While the pesticides business of CIL is being transferred to the new company, the CIL agricultural chemicals division will continue its other operations such as the manufacture and sale of superphosphate and compound fertilisers and the sale of fertiliser materials.

Transvaal Phosphate Plant

AT THE official opening on 27 August of the Phosphate Corporation's new plant at Phalaborwa, in the north-eastern Transvaal, the Prime Minister said that during the past three years or so, it had been proved conclusively, by the results of the prospecting carried out by the Department of Mines, that the deposits of phosphate in the area concerned were much larger than originally expected. A conservative estimate was that with a production of 400,000 to 500,000 tons per annum, there would be sufficient ore for the next 100 years or more.

The tests of the past six months had been so satisfactory that the directors of Foskor were convinced that the whole enterprise could be run on a satisfactory profit basis.

The Cabinet would take into serious consideration the recommendation of the Foskor directorate to be allowed at least to treble and even to quadruple this enterprise. 'Together with the large quantities of nitrogen which Sasol is making available to the fertiliser industry, these phosphate concentrates can make a most valuable contribution in stimulating food supplies for our ever-growing population'.

• HOME •

Charles Lennig Plan Extensions

Charles Lennig & Co. (Great Britain) Ltd., who have taken over premises at Jarrow-on-Tyne for making industrial chemicals, are negotiating for the purchase of seven acres of land for proposed extensions.

Chilean Nitrate Prices

From 1 October the price for Chilean refined granulated nitrate of soda, over 98 per cent, in lots of six or more tons, delivered, is £28 10s. per ton. Smaller lots are subject to surcharges: four tons but less than six tons, 5s. per ton; two tons, but less than four tons, 10s.; one ton, but less than two tons, £1; one cwt., but less than one ton, £1 10s.

Whitehaven College Opened

Whitehaven's new College of Further Education opened on 26 September with a one-day conference of 80 British, and one Canadian scientist, on radiation chemistry. They were welcomed by the principal, Dr. H. Gregson. Among the lecturers was Dr. R. Roberts, of the Atomic Research Establishment at Harwell. Professor F. S. Dainton, of Leeds University, presided.

Sir Alexander Fleming Memorial

A bronze portrait tablet of Sir Alexander Fleming, the discoverer of penicillin, was unveiled on 29 September in the works canteen of the Distillers Co. (Bio-Chemicals), Speke, factory where the 4,000 employees produce over 1,000,000 doses of penicillin a week. Mr. J. J. Hastings, technical director, presided. The tablet was provided by the company.

Five Identical Salt Tenders

Five companies who made identical tenders for supplying large quantities of salt were named at a recent meeting of the Stoke Newington (London) borough council. The council decided to send details of the case to the Monopolies Commission. The salt was needed for snow clearance and tenders were asked for 100 tons of crystal salt and the five firms quoted an identical price of £9 4s. a ton. Identical tenders were received from the same five firms for 20-ton lots of rock salt. The firms were: Cerebos, I.C.I., J. Manger & Sons (whose tender was later accepted), Palmer Mann & Co., and the Premier Salt Co.

Simon-Carves Issue Oversubscribed

The offer of 850,000 ordinary 5s. shares at 22s. in Simon-Carves on 29 September was open for only five minutes, but the issue was subscribed over 10 times. The total number of shares applied for was 15,358,250

Epikote Resins Price Reduction

On 1 October the Shell Chemical Co. reduced the price of Epikote resins 1001, 1004, 1007 and 1009 by £20 per ton for quantities of one ton and over.

Monsanto Hosts to Newport Council

Mr. Edward A. O'Neal, Jun., chairman, and directors of Monsanto Chemicals Ltd., were hosts at luncheon on 27 September at their Newport works to the Mayor of Newport (Mrs. Letitia Bell), the Mayoress (Miss Dorothy Denman), and members of Newport Town Council.

Huddersfield Tip Fire Inquiry

Following a meeting of the Huddersfield Town Council which was attended by the chief constable and the chief fire officer, and Professor F. C. Tryhorn and Dr. H. Powell of the Home Office Forensic Science Laboratory, a meeting with a sub-committee and representatives of L. B. Holliday & Co. was held on 6 October to discuss the tip blaze at the firm's Huddersfield factory.

New Treasury Order

The Treasury have made the Import Duties (Exemptions) (No. 9) Order, 1955. Siloxanes, whether polymerised or not, and certain mixtures containing 50 per cent or more by weight of siloxanes are exempt from duty chargeable under the Import Duties Act, 1932. This Order extends the exemption to cover all such mixtures, and came into operation on 29 September, 1955.

Laboratory Upsets Horses' Form

Noise, lights, and smell that came from a laboratory next door to a racehorse trainer's stable affected the running of the horses. This was alleged at a public inquiry when the trainer, Mr. Ronald Smyth, supported the Epsom Borough Council in its refusal to grant Photo Chemicals Ltd. planning permission for a processing and chemical laboratory to be built on the site in Church Road, Epsom.

• OVERSEAS •

Indian Ammonium Sulphate Figures

The Indian Sindri Fertiliser Factory produced 154,121 tons of ammonium sulphate between January and June, 1955.

Soviet-Austrian Oil Agreement

The agreement on shipments of crude oil from Austria to the Soviet Union in compensation for the mineral oil enterprises returned to Austria by the Soviet provides for annual shipments of 1,000,000 tons of crude oil for the next ten years. The agreement on mineral oil does not contain any penalty clauses nor any specifications on the depositing of dollar guarantee drafts.

Du Pont Explosives Plant

Du Pont of Canada has announced that the construction of its $17,000,000 commercial explosives plant in Ontario will begin within the next two or three weeks. The general contract for the building project has been awarded to Fraser Brace Engineering Co., of Ontario.

Professor Rudd is Confident

Professor Eric Rudd, of Adelaide University, announced in Sydney recently that test drillings for oil in Australia had proved that the chances of making a major discovery were favourable. Thicker and deeper marine sedimentary sections have been found in Queensland and Western Australia than were known before, he said, and he was confident that an extensive oil industry would be developed.

Thorium Find in Turkey

The Turkish Press has reported that thorium has been discovered near the famous stalactite cave at Antalya, southern Anatolia.

More Paper from Cane Bagasse

The only plant in the US using whole sugar cane bagasse for paper manufacture, the Valentine Pulp and Paper Co., is being expanded from its present capacity of 50 tons of paper daily to 75 tons. The plant is seven miles south of New Orleans on Bayou Lafourche, in the heart of Louisiana's sugar bowl. Bagasse is the dry stalk of sugar cane after the juice has been extracted. Louisiana produces an estimated 800,000 tons of dry bagasse a year, less than 40 per cent of which is used.

First Mexican Gas for US

Petroleos Mexicanos, the Government oil monopoly, announced the signing of a contract with the Texas Eastern Transmission Corp., of Louisiana, for the sale of Mexican natural gas in a minimum amount of 200,000,000 cu. ft. It will be the first Mexican gas exported to the US.

Petrofina to Enter Germany

Petrofina, the Belgian oil group, proposes to start a petrol and oil distribution business in Germany. A new company, Deutsche Purfina, is to be registered to undertake the business. Petrofina are negotiating with Bayer of Leverkusen for 75 per cent share of the Roerbau Co. which operates an oil refinery at Mulheim, Cologne.

Cement Activity in Edmonton Area

In Edmonton, Alberta, the $8,000,000 plant of Inland Cement Co. Ltd., representing both Canadian and Belgian capital, is now under construction. When completed early next summer, the plant will have an initial production capacity of 2,500 barrels per day. The Canada Cement Co. Ltd. is erecting a $2,000,000 plant in another section of the Edmonton area.

China Making Zinc Oxide

Zinc oxide is now being manufactured in Mainland China and is available for export. Quantities sold in Hong Kong to date have been 99.2 per cent in quality and, with allowance made for this comparatively low purity, have been found satisfactory. Current prices are quoted at HK$0.62 per lb. c.i.f. Hong Kong.

European Competition

European competition is being felt in fine chemical products in Canada, particularly vitamins, the Purchasing Agents Association of Toronto reports. Industrial chemicals are in good demand with selling prices firm. Increases have been announced or are expected to be made for boron products, caustic potash, turpentine, copper sulphate and zinc and lead chemicals. A future possibility is the establishment of a plant for mining and processing potash deposits near Unity, Saskatchewan, the association states. Potash is not now produced in Canada.

· PERSONAL ·

At a meeting of the board of directors of Monsanto Chemicals Ltd. held on 27 September, MR. T. P. BERINGTON was elected vice-chairman of the company. Born in Little Malvern, Worcestershire, in 1905, Mr. Berington joined Monsanto in May, 1929, and was appointed to the board of directors in March, 1930.

MR. JAMES RUDDY has been appointed managing director of William Fulton & Sons Ltd., dyers, of Paisley, Scotland. Mr. Ruddy began his career at the Calico Printers' Association Ltd. Later he joined Brown & Adam Ltd., and in 1930 went to William Fulton & Sons Ltd. as technical manager. After becoming sales manager, he was appointed sales director in 1948. He has been chairman of the Spun Rayon Dyers' Fabrics Group since 1951.

MR. A. C. STEWART has just been appointed assistant sales manager of Chloride Batteries Ltd. He will be working in this capacity under the direction of MR. E. POWELL, director and sales manager of the company. Mr. Stewart originally joined the company in March 1921, when, after training, he was appointed service manager at the Exide Works at Clifton Junction near Manchester, later moving to the Bristol Exide depot. He remained at Bristol until 1931, when he was recalled to head office in London to become manager of the Drydex department of Chloride Batteries Ltd.

The Lord President of the Council has appointed PROFESSOR P. M. S. BLACKETT, M.A., F.R.S., Professor of Physics, Imperial College of Science and Technology, and MR. H. DOUGLASS, general secretary of the Iron and Steel Trades Confederation, to be members of the Advisory Council for Scientific and Industrial Research from 1 October 1955. MR. J. CRAWFORD, JP, PROFESSOR T. R. C. FOX, M.I.Mech.E., M.I.Chem.E., and SIR GEORGE THOMSON, D.Sc., LL.D., F.R.S., retire from the Council on 30 September 1955, on completion of their terms of office.

Three appointments to its newly-formed chemical products department are announced by Imperial Oil Ltd. The general manager is MR. CLAYTON M. BEAMER, who has had wide experience in chemical manufacturing and sales and has done extensive research work with alcohols, esters and glycols. Formerly he was assistant general manager of the chemical products department of Esso Standard Oil Co. in New York. MR. T. B. DOHERTY is manager of the technical division of the new department. He joined Imperial as a process engineer and moved up through a number of refinery appointments to the position of management assistant in the manufacturing department. DR. W. W. STEWART, M.B.E., is manager of the sales division of the department. He was formerly assistant manager of the technical division of the company's marketing department. He has been with Imperial since 1935. During World War II he was director of the chemicals and explosives division, Washington office, Canadian Department of Munitions and Supply.

MR. WILLIAM JOHN STEWART ROBERTS, B.Sc., F.I.M., has been appointed chief metallurgist of the tinplate division of the Steel Co. of Wales Ltd. Mr. Roberts was formerly chief metallurgist at the Trostre works. In 1936 he was a senior chemist with Firth Brown of Sheffield.

The engagement has been announced of DR. F. PETER WOODFORD, only son of the late MR. W. C. WOODFORD, and of MRS. M. R. WOODFORD, of York Road, Erdington, Birmingham, and MISS ANN CHRISTINE BARRATT, elder daughter of DR. and MRS. A. BARRATT, of The Old Gardens, Cardigan Road, Leeds. Dr. Woodford is an organic chemist who recently graduated from the textile department of Leeds University, where he studied for three years. Previously he had read chemistry at Balliol College, Oxford. Aged 25, he will shortly go into the Royal Air Force. Miss Barratt, who is 21, is a nurse at St. Bartholomew's Hospital, London.

MR. JOHN H. LORD, Dunlop executive director, has left London by air on a visit to India, Malaya and Japan. He will visit the company's factories and plantations and have discussions with government and other

officials. From Japan he will fly back via Los Angeles and then via the North Pole to Copenhagen and on to London at the end of October.

The Ministry of Supply announces that MR. F. S. BARTON has been appointed Adviser, Defence Supplies (Ministry of Supply) to the United Kingdom High Commissioner in Canada. DR. D. H. BLACK has been appointed Principal Director of Electronics Research and Development in succession to Mr. Barton, and DR. W. H. WHEELER will succeed Dr. Black as head of the United Kingdom Ministry of Supply Staff, Australia, and Scientific Adviser to the United Kingdom High Commissioner in Australia.

DR. ALVIN M. WEINBERG has been appointed director of Oak Ridge National Laboratory. The Laboratory is the USA's leading atomic research centre and the chief source of radioisotopes used in medical research, agriculture, and many industrial operations. From Oak Ridge National Laboratory have come atomic reactors designed for research purposes and for power. The US Exhibit Reactor, a main feature at the recent International Conference on the Peaceful Uses of Atomic Energy in Geneva, Switzerland, was designed, built, and operated by Laboratory personnel. Dr. Weinberg, who is 40 years old, attended the University of Chicago, where he received the A.B. degree in 1935. He continued his studies at the University and was awarded the M.S. degree in 1936 and the Ph.D. degree in 1939. In 1942, he joined the Manhattan District's Metallurgical Project, where he contributed to the design of the nuclear reactors used in the production of plutonium. Since 1945 he has been associated with Oak Ridge National Laboratory, holding the post of Director of the Physics Division. In 1948, he became Research Director at the Laboratory.

For the first time in the history of the 106-years-old Liverpool Chemists' Association the honour of life vice-president has been conferred on two senior members—MR. H. HUMPHREYS JONES, F.P.S., and MR. J. L. HIRST, M.P.S. They have also been made first life vice-chairmen of the Liverpool branch of the Pharmaceutical Society.

Six new committee chairmen have been appointed by the board of directors of the Manufacturing Chemists' Association in the US. The new committee chairmen are: *finance committee:* MR. JOHN FISTERE, president, Mallinckrodt Chemicals Works; *programme committee:* MR. HANS STAUFFER, president, Stauffer Chemical Co.; *International trade and tariff committee:* MR. RICHARD F. HANSEN, assistant to the president, Allied Chemical & Dye Corp.; *public relations advisory committee:* MR. EMERY N. CLEAVES, vice-president, Celanese Corp. of America; *statistical committee:* MR. O. V. TRACY, president, Enjay Co. Inc.; *water pollution abatement committee:* MR. H. L. JACOBS, engineering department, E.I. du Pont de Nemours & Co. Inc.

MR. F. RICHARD KING, buying manager, retires from Imperial Chemical Industries Ltd. in October after nearly 36 years in the purchasing field. Joining British Dyestuffs Corporation after the First World War he started at Turnbridge Works, Huddersfield, transferring to Manchester and to Blackley with the BDC's head office staff. On the formation of I.C.I. he came to London as an original member of L. H. Swinbank's central purchasing department, continuing to purchase coal tar products and dyestuffs intermediates in which he has spent practically all of his long career.

Obituary

MR. RICHARD BERTRAM PILCHER, O.B.E., F.C.I.S., formerly registrar and secretary of the Royal Institute of Chemistry, which he served for 53 years, died at his home at Northwood, Middlesex, on Saturday, 1 October, aged 81. Born in 1874 at Patrixbourne, near Canterbury, Mr. Pilcher was a former president of the Chartered Institute of Secretaries. The author of a number of books which became standard references in the chemical industry, he was one of eight honorary fellows of the Royal Institute of Chemistry.

Chemical Filling Stations

Canadian Industries (1954) Ltd. announce that a $300,000 extension will be made on its warehouse and chemical filling station facilities at Point St. Charles. The building contract has been let to Foundation Company of Canada and occupancy is planned for next spring.

Publications & Announcements

ISOPAD LTD., 30-32 Rosemont Road, London, N.W.3, have issued a new leaflet on 'Isojackets' their combined electric heating and lagging units for columns and pipes and cylindrical vessels of all dimensions. Isojackets are made in two halves which are either hinged or bolted together and comprise a heating panel backed by glass wool lagging and enclosed by cylindrical sheet metal casings. Standard appliances are suitable for temperatures up to 400°C, while quartz cloth jackets are available for high temperature work up to 800°C. Cutouts can be provided to accommodate side inlets and outlets. For use in flameproof areas a special type of heating element is provided which is led into flameproof terminal boxes. Units between 12 and 60 in. in length, from 1 to 48 in. diameter are listed. Standard loadings are 150, 300, 500 and 700 watts per sq. ft.

* * *

CORROSION Limited have announced the introduction of Glocrete SR, which they claim is the first synthetic rubber floor coating and is not to be confused with chlorinated or isomerised rubbers which are modified natural rubbers. Glocrete SR is supplied as a single solution ready to use material and does not require the addition of a hardener or curing agent. It is applied by normal paint techniques, and is for use on concrete, bricks, tiles, stone and masonry in general, and also on wood and metal. The coating is available for light traffic within 10 hours and will tolerate heavy traffic after 48 hours. This material is claimed to be very hard and after eight days it is said to attain a hardness of 85 per cent of that of plate glass. Resistance to chemicals is also indicated to be good. The material is available either as a clear coating or in a range of colours. Cost is of the same order as that of chlorinated rubber coatings.

* * *

ETHYL acrylate, n-butyl acrylate, 2-ethylbutyl acrylate and 2-ethylhexyl acrylate are described in a technical bulletin recently issued by Carbide & Carbon Chemicals Co., a division of Union Carbide & Carbon Corp. The booklet covers methods of polymerisation, applications of polymers and copolymers, and selected references. Physical and chemical properties, shipping data, and reactions of the acrylic esters in chemical syntheses are also described. Polymers and copolymers of the acrylic esters are used in the manufacture of adhesives, protective coatings, leather and textile finishes, paper treating, synthetic fibres, oil additives, plasticisers, and speciality rubbers. Acrylic esters are also important intermediates in the manufacture of pharmaceuticals, resins and plastics, insecticides, and numerous other compounds. Copies of this new bulletin (F-7434) are available from Carbide & Carbon Chemicals Co., 30 East 42nd Street, New York 17, New York.

* * *

LUBRICATION for such hard worked machinery as crushers is claimed to be readily possible with Molykote, a form of molybdenum disulphide produced by K. S. Paul Ltd., Great Western Trading Estate, Park Royal Road, London, N.W.10. Molykote will, the makers say, eliminate pick-up and other troubles during running-in, and in many cases will eliminate the effects of slight misalignment which is not always avoidable when erection takes place on the site. Molykote is a fine powder, although it may be in carriers of various kinds. Only when the powder combines with the surface is a high lubricating value film obtained. Pressure always helps in forming this bond. In fact the higher the pressure the lower the coefficient of friction. It is always advisable to degrease the components first before applying Molykote.

* * *

FEATURED in the current issue of the Wild-Barfield *Heat-Treatment Journal* is the last of a series of articles on 'Gas Carburising Practice' by L. G. W. Palethorpe. F.R.I.C., F.I.M. Having previously discussed fundamental principles of gas carburising and the production of suitable atmospheres, the author completes his series by discussing the furnaces in which the process is conducted. Other articles in this issue are devoted to electric furnaces for spheroidising, electric furnaces for vitreous enamelling, and a description of a new Universal progressive hardening machine.

Law & Company News

Commercial Intelligence

The following are taken from the printed reports, but we cannot be responsible for errors that may occur.

Mortgages & Charges

(Note.—The Companies Consolidation Act of 1908 provides that every Mortgage or Charge, as described herein, shall be registered within 21 days after its creation, otherwise it shall be void against the liquidator and any creditor. The Act also provides that every company shall, in making its Annual Summary, specify the total amount of debt due from the company in respect of all Mortgages or Charges. The following Mortgages or Charges have been so registered. In each case the total debt, as specified in the last available Annual Summary, is also given—marked with an *—followed by the date of the Summary but such total may have been reduced.)

PYRENE CO. LTD., Brentford, Middlesex, fire extinguisher manufacturers.—2 September, £500,000 debenture stock with a premium of up to five per cent payable in certain circumstances secured by a trust deed dated 30 August, 1955; general charge. *Nil. 2 June, 1955.

REYNOLDS PAINT & VARNISH CO. LTD., Liverpool.—30 August, mortgage to Martins Bank Ltd. securing all moneys due or to become due to the bank; charged on 299 Burlington Street, Liverpool, with plant and fixtures, etc. *£800. 11 March, 1953.

Satisfactions

BRITISH EBONITE CO. LTD., London W.—Satisfaction, 2 September of debentures registered 20 February, 1926, to the extent of £1,700.

LANCASHIRE TAR DISTILLERS LTD., Manchester.—Satisfaction, 3 September of trust deed registered 24 January, 1951, to the extent of £12,043.

Changes of Name

MACTAGGART & EVANS LTD., Sondes Place, Dorking, Surrey, to Sondes Place Research Laboratories Ltd.

CALDER SOAP CO. LTD., Valley Road, Liversedge, Yorkshire, to CALDER CHEMICALS (ASHBY) LTD., on 16 June, 1955.

Increases of Capital

SUPERVITE MANUFACTURING CO., LTD., 34 Crutched Friars, London E.C.3, increased by £4,000, in £1 ordinary shares, beyond the registered capital of £1,000.

HEDON CHEMICALS LTD., 21 St. James Square, London S.W.1., increased by £199,900, in 99,950 'A' ordinary and 99,950 'B' ordinary shares of £1, beyond the registered capital of £100.

POROSAN LTD., 103 Cannon Street, London E.C.4, increased by £1,500, in £1 ordinary shares, beyond the registered capital of £500.

MUNRO VITAREX LTD., chemical manufacturers, etc., Ray Laboratories, Pilgrim Hill, London S.E.27, increased by £5,000, in £1 ordinary shares, beyond the registered capital of £5,000.

CUSSONS SONS & CO. LTD., Kersal Vale, Manchester 7, increased by £250,000, in 2s. 'A' ordinary shares, beyond the registered capital of £250,000.

Company News

Imperial Chemical Industries Ltd.

Imperial Chemical Industries Ltd. have declared an interim dividend of 4 per cent (actual) in respect of the year ending 31 December, 1955, on the ordinary stock of the company. This dividend will be payable on 30 November, 1955, less income tax at the United Kingdom standard rate for 1955/56 to members on the register on 7 October, 1955.

British Burmah Petroleum Co.

Consolidated net profit of the group, before tax, amounted to £45,176, which, after providing £8,459 for tax, was practically sufficient to cover the dividend payment at the same rate as in the previous year. After transferring £25,000 to reserve against diminution in value of investments, the carry forward in the consolidated profit and loss account amounted to £78,709.

Glaxo

Recommendation for a final dividend of 10 per cent by Glaxo Laboratories makes 12½ per cent for the year ended 30 June last on the ordinary capital doubled by a scrip issue to £3,185,400.

Murphy Chemical Co.

Stockholders have been informed that an offer made to purchase the entire issued capital of the company has been accepted by holders of over 90 per cent of the ordinary shares. The Murphy Company is a private

[continued on page 800

Company News

continued from page 798

concern engaged in the manufacture and distribution of insecticides, fungicides and fumigants at Wheathampstead, Herts. There will be no changes in the Murphy management. The company will market products made by Glaxo that have application in its field of activity.

Amalgamated Anthracite Holdings

Trading profit for the year ended 31 December, 1954, was £592,198, compared with £578,496 for the previous year. Net profit before taxation comes out at £430,299, compared with £404,668 in 1953, and a dividend of 6 per cent on the ordinary stock has been approved. In his statement to shareholders the chairman, Mr. John Waddell, said: 'I reported last year that the companies in which we are interested and which manufacture carbon black were modernising their factory at Port Tennant in agreement with United Carbon Co. Inc., of America. It was hoped that the losses made in the earlier part of 1954 would be eliminated after the re-opening of the plant which was closed in August, 1954, for reconstruction. Unfortunately, as so often happens, the reconstruction took longer than anticipated and the plant did not reopen until November, 1954. The plant is now making both ends meet and will improve'.

T. Mitchinson & Co.

The T. Mitchinson & Co. chemical firm is to be converted into a limited company under the title—Mitchinson & Co. Ltd. The new company will execute all outstanding contracts and handle all transactions from 1 October, 1955. The address of the company is 14 St. Peter's Square, Manchester 2.

Lawes Chemical Co.

At the annual general meeting in the May Fair Hotel, London, on Monday, 26 September, Mr. F. A. Perkins, chairman of Lawes Chemical Co., announced that production of phosphate rock, the company's principal raw material, has been resumed in North Africa and should reach normal figures within the next two weeks. The company has had a successful trading year and the directors have recommended a 10 per cent dividend on the increased issued capital which now stands at £340,845. During October it will become necessary to readjust selling prices as the company is now having to contend with further increased costs of raw materials, due in the main to higher freight costs on phosphate rock and the recently announced increased cost of nitrogen supplies.

George Kent Ltd.

Provisional allotment letters have now been issued by George Kent Ltd., industrial instrument manufacturers, of Luton, for the right offer of 480,000 10s. ordinary shares at 26s. each. Ordinary stockholders registered on 20 September are entitled to subscribe on the basis of one for two and to apply for any excess shares. Commander P. W. Kent, the chairman, in a letter to ordinary stockholders, states that the demand for the company's products continues at a high level and a satisfactory rate of exports is being maintained. The directors say they have confidence in the company's ability to maintain the 15 per cent ordinary dividend on the increased capital.

Lewis Berger & Sons Ltd.

Founded two centuries ago, the Lewis Berger & Sons Ltd. (paints etc.) group now operates 20 factories in Commonwealth countries, France and Eire. The international scope of these activities is extended by technical and sales links in Europe and with the Sherwin-Williams organisation in the US. For the year ended 31 March, 1955, the chairman of the company, Mr. Thomas Lilley, announced that there is a further improvement in trading profit, the resulting group profit for the year, after tax deduction, is £474,101, compared with £377,066 in the preceding year. The balance available for the holding company is £424,404 compared with £328,890. The interim dividend on ordinary stock was 4 per cent, as in the previous year. The final dividend recommended by the directors is at the same rate as last year, 11 per cent, but payable on the total issued capital which has been increased by over 25 per cent. Income from association with Styrene Co-polymers Ltd. arises for the first time and has proved a sound investment.

New Registrations

Nicerol Fire Protection Ltd.

Private company. (31,015). Capital £100

[continued on page 802

Company News

continued from page 800

in £1 shares. Objects: To carry on the business of manufacturing, exporting and importing all types of chemical compounds suitable for the extinguishing and prevention of fire, etc. The subscribers (each with one share) are: J. C. Osborne, 18 Main Road, Castlehead, Paisley, solicitor; and V. K. McElvan, 11 Mitchell Drive, Rutherglen, solicitor. The first directors are to be appointed by the subscribers.

Dr. H. Schweitzer Ltd.

Private company. (554,383). Capital £100 in £1 shares. Objects: To carry on the business of heat treatment engineers, chemical manufacturers, and metallurgists, chemical consultants, etc. The directors are: Hans Schweitzer, Mrs. Stephanie P. C. Schweitzer and Frank A. W. Schweitzer, all of 85 Bromley Road, Shortlands, Kent. Secretary: Stephanie P. C. Schweitzer. Registered office: 85 Bromley Road, Shortlands, Kent.

L. A. Horner & Sons Ltd.

Private company (554,091.) Capital £12,000. To carry on the business of wholesale druggists and export merchants, etc. Directors: Leonard A. Horner, Mrs. Shirley F. Horner and Edward H. Flaxman. Reg. office: 47/9 The Highway, London E.1.

Halewood Laboratories Ltd.

Private company (553,998.) Capital £100. To carry on the business of manufacturers of and dealers in pharmaceuticals, drugs, fine and heavy chemicals, laboratory reagents, etc. Directors: Norman C. Weaver and Paul H. Mace. Reg. office: 118/119 Cheapside, London E.C.2.

British Oxygen Arc Equipment Ltd.

Private company. (554,021). Capital £50,000 in £1 shares. To carry on the business of manufacturers of and dealers in apparatus connected with the supply, storing and dispensing liquid oxygen and liquid nitrogen for use on aircraft, etc. Directors: Francis J. Clark, Matthew Seaman, Marquard J. Anderson and Anthony B. L. Murison. Registered office: Bridgewater House, Cleveland Row, St. James', S.W.1.

British Oxygen Gases Ltd.

Private company. (554,821). Capital £15,000,000 in £1 shares. To acquire the manufacturing and trading business in industrial and medical gases carried on by the British Oxygen Co. Ltd. at their various factories in the United Kingdom, etc. Directors: Thomas E. Potts, Malcolm K. Arnott, Nevil L. G. Lingwood, Gerard W. Lake, Robert C. Hesketh-Jones, Francis W. B. Kittel and Henry Coburn. Registered office: Bridgewater House, Cleveland Row, St. James's, London S.W.1.

Market Reports

LONDON.—Activity on the industrial chemicals market continues at a high level with home consumers calling for good deliveries against contracts. As expected the export trade figures for August show a considerable improvement, the demand for chemicals being well above the corresponding month in 1954. A number of prices have been adjusted to meet increased costs and, in addition to those mentioned last week, borax and boric acid have been raised by 20s. and 30s. per ton respectively and perborate of soda is £3 per ton dearer. The fluctuations in metal prices have not, as yet, affected the compounds. Pitch is moving well in a steady coal-tar product market, and a better inquiry is reported for cresylic acid.

MANCHESTER.—A well-sustained demand for heavy chemical products from the textile and other leading industrial outlets has been reported on the Manchester market during the past week. Fresh home and export inquiries covering a wide range, including the soda and ammonia compounds, have been fairly numerous and in view of the pronounced firmness of the market business is coming forward steadily as the need for replacement arises. Fair buying interest is now being shown in fertilisers. The call for creosote oil, carbolic acid and most other tar products is steady.

GLASGOW.—The past week's trading has been very brisk and business in most sections of the chemical industry has shown an improvement. The reduction in the price of copper derivatives was extremely welcome. There were no other important changes in prices to be reported. In regard to agricultural chemicals, seasonal demand has resulted in continued activity. A fair volume of inquiries are being received for export.

Next Week's Events

MONDAY 10 OCTOBER

The Institute of Fuel

Fishburn: North Eastern Section. Afternoon visit to Fishburn coking plant, 2.30 p.m. Evening, in the Chemistry Lecture Theatre, Kings' College, Newcastle-upon-Tyne, 6.30 p.m. 'Coal Preparation and Evaluation' by J. K. Matthews.

TUESDAY 11 OCTOBER

SCI (Plastics & Polymer Group)

London: Rooms of the Chemical Society, Burlington House, Piccadilly, W.1, 6.30 p.m. 'Some Dynamic Properties of Polymers' by H. Warburton Hall (Ministry of Supply), 'The Measurement of the Flow Properties of Plastics at High Shearing Stresses' by R. Hayes, B.Sc., A.R.C.S., and D. A. Lannan, B.Sc., and 'Some Frictional Properties of Plastics' by Dr. Anita Bailey.

Institution of Chemical Engineers

Chester: The Grosvenor Hotel, 9.30 p.m. Joint Conference with the Society of Instrument Technology Ltd.

The Institute of Physics

Newcastle-upon-Tyne: Kings' College, 6.15 p.m. 'Thermal Insulation' by E. G. Cawte, A.Inst.P.

WEDNESDAY 12 OCTOBER

SCI (Food Group)

London: The Linnean Society, Burlington House, Piccadilly, W.1, 6.30 p.m. 'Factors Affecting the Choice of Food' by Professor J. Yudkin, M.A., Ph.D., M.D., B.Ch., F.R.I.C., M.R.C.P., D. Sheppard, B.A., Ph.D., M. Abrams, B.Sc., Ph.D.

Society for Analytical Chemistry

Birmingham: Mason Lecture Theatre, The University, Edmund Street, Birmingham 3, 7 p.m. 'The Analysts Dilemna: Colour or Stability' by R. J. P. Williams, M.A., D. Phil., A.R.I.C.

RIC (London Section)

Isleworth: Grammer School, Ridgeway Road, 7 p.m. 'Textiles and the New Synthetic Fibres' by B. P. Ridge, B.Sc., Ph.D., F.T.I., F.R.I.C.

THURSDAY 13 OCTOBER

Society of Cosmetic Chemists

London: The Royal Society of Arts, John Adam Street, W.C.2, 7.30 p.m. 'A Spectrophotometric Quality and Stability Criterion for Medicinal Liquid Paraffin' by R. Schnurmann, M.Sc., Dr. Rer. Nat., F. Inst. P., F. Inst. Pet., M.S.I.T.

The Chemical Society

Liverpool: The University, 5 p.m. 'The Mechanism of the Liquid Phase Oxidation of Decane' by Dr. G. H. Twigg, B.Sc.

FRIDAY 14 OCTOBER

The Chemical Society

Birmingham: Chemistry Department, The University, 4.30 p.m. 'New Aspects of Aromatic Character' by Professor Wilson Baker, D.Sc., F.R.I.C., F.R.S.

Royal Institute of Chemistry

London: Rubens Hotel, S.W.1, 7 for 7.30 p.m. Seventh annual dinner and dance.

SATURDAY 15 OCTOBER

Institution of Chemical Engineers

Nottingham: The University, 3 p.m. 'The Mechanism and Operation of Bubble Cup Plates' by Professor F. H. Garner, O.B.E., M.Sc., Ph.D., M.I.Chem.E., M.I.Mech.E., F.Inst.Pet., and D. C. Freshwater (Associate Member).

New Detergent

Chemical Development of Canada Ltd. has just completed the installation of equipment to produce a new detergent grade of sodium carboxymethylcellulose, it is announced by D. M. Matheson, vice-president and general manager. This product will be sold under the name Carboxel D-435. Earlier this year the company took over the sodium carboxymethylcellulose plant formerly operated by Standard Chemical Company. With the production of the new detergent, Chemical Development of Canada now becomes the only Canadian manufacturers of both crude and refined grades which find use in the textile, paper, food and pharmaceutical industries.

Austrian Fertiliser Exports

The Linz Nitrate Fertiliser Plant of Austria exported 356,000 tons of nitrate fertiliser to 28 countries during the year 1954/55, of which three-quarters went to European countries. The Austrian home market received 185,900 tons of fertiliser, as compared to 147,200 tons during 1953/54.

CLASSIFIED ADVERTISEMENTS

SITUATIONS VACANT

The engagement of persons answering these advertisements must be made through a Local Office of the Ministry of Labour or a Scheduled Employment Agency if the applicant is a man aged 18-64 *inclusive, or a woman aged* 18-59 *inclusive, unless he or she, or the employment, is excepted from the provisions of the Notifications of Vacancies Order,* 1952.

B. PHARM., or B.Sc., or A.R.I.C., not over 35 years of age, with experience in analytical work, is invited to apply for wholetime position of **CONTROL CHEMIST** in London Manufacturing Pharmaceutical Chemists' testing laboratory (close to London Bridge). Commencing salary at rate of £1,000 per annum, with annual increments of £50 up to £1,500. The position carries a contributory pensions scheme and work is five days a week. The post is suitable only for a Chemist desirous of establishing himself in what is intended to be a permanent position. Send full details of experience and qualifications to **BOX 356, ERWOODS, LTD., 211, PICCADILLY, W.1.**

CHEMIST with experience in lecturing required to assist in Education and Information Departments. Salary in the range £650-£855—Write giving full particulars, to **DIRECTOR B.L.R.A. LABORATORIES, HILL VIEW GARDENS, N.W.4.**

HUNTINGTON, HEBERLEIN & CO., LTD., a subsidiary of Simon-Carves Ltd., have vacancies for :—

(i) senior design structural draughtsmen, experience in the design of bunkers, steel frame buildings, light structures, etc.

(ii) senior mechanical design draughtsmen, experience in design of mechanical handling equipment an advantage.

Good working conditions, 5 day week, 3 weeks' holiday, pension scheme and luncheon vouchers. Commencing salary depending on experience, age, etc. Write full personel details **Staff Department, 114 Cromwell Road, S.W.7.**

INDUSTRIAL CHEMIST required by leading container closure manufacturers in Midlands. Progressive position requiring knowledge metal printing, varnishing, stoving, and metallurgy, associated with food packaging industry, Maximum age 35 years.—Written applications, with details of experience previous appointments, etc., to P. A. METAL CLOSURES LTD., BROMFORD LANE, WEST BROMWICH, STAFFS.

MINISTRY OF SUPPLY requires **CHEMIST** at Harefield, Middiesex, to assist in direction of inspection of non-metallic materials, including rubber, plastics, glass, adhesives, protective coatings, fuels, lubricants and electrical insulating materials. **Qualifications**—British of British parents. Honours Degree Chemistry or Physics or A.R.I.C., A.Inst.P., A.M.I.Chem.E. or equivalent qualifications. Appropriate industrial experience. **Salary**—Within £675 (age 25) to £1,055. Not established but opportunities to compete for establishment may arise. Application forms from M.L.N.S., Technical and Scientific Register (K), 26 King Street, London, S.W.1, quoting F715/5A. Closing date, 5 November, 1955.

GRADUATES in **MECHANICAL** and **CHEMICAL ENGINEERING** required for progressive positions in the Research, Design and Production Divisions of THE POWER-GAS CORPORATION LIMITED. Training given to men without previous industrial experience. Apply to :—**STAFF PERSONNEL MANAGER, PARKFIELD WORKS, STOCKTON-ON-TEES.**

NORTH THAMES GAS BOARD.

CHEMISTS and **PHYSICISTS** holding University degrees are required in the Laboratories at Watson House, Fulham, S.W.6, to undertake research work on the utilization and design of domestic and industrial gas and coke appliances, particularly on cookers, water heaters, gas and coke fires, refrigerators, and industrial apparatus. The Laboratories have recently been modernized and extended and are responsible for research work for the Gas Industry throughout the country.

The appointments will be permanent and pensionable and the starting salary will be within the range of £635 to £850 per annum, according to age, qualifications and experience.

Applications should be sent to the Staff Controller, North Thames Gas Board, 30, Kensington Church Street, W.8, quoting reference No. 666/280, to reach him within ten days of the appearance of this advertisement.

FOR SALE

CHARCOAL, ANIMAL AND VEGETABLE horticultural, burning, filtering, disinfecting, medicinal, insulating; also lumps ground and granulated; established 1830; contractors to H.M. Government.—THOS. HILL-JONES, LTD., "INVICTA" WORKS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH LONDON." TELEPHONE: 2285 EAST.

MORTON, SON AND WARD LIMITED
offer

HYDRO EXTRACTORS

36" and **21"** 'HYDRO EXTRACTORS by BROADBENT, equal to NEW, belt driven through centrifugal clutch with safety interlocks. Steel galvanized baskets. **48"** by **BROADBENT** all electric under driven, pit type, 3 point suspension, steel galvanized basket, with starter.

MIXERS

NEW 'MORWARD' 'U' shaped MIXING VESSELS made to requirements in s.s. or m.s. Jacketed or unjacketed, with or without mixing gear.

JACKETED PANS

NEW 100g, 150g, and 200g in m.s. for 100 lb. w.p. with or without mixing gear.

20g. STAINLESS STEEL Jacketed pan, bottom outlet 40 lb. p.s.i.

SECOND HAND EQUIPMENT

MIXERS, JACKETED PANS, etc. available from stock—all in good condition.

PUMPS

Selection of new MONO and second hand pumps in stock, 2" to 5".

Enquiries invited

MORTON, SON AND WARD LIMITED,
WALK MILL,
DOBCROSS, NEAR OLDHAM,
LANCS.
Phone : Saddleworth 437

SACK AND BAG MERCHANTS AND MANUFACTURERS. New and reconditioned for Home and Export. (Use **JUTEX** for sack repairing.) **ALTRINCHAM JUTE LTD., WRIGHT STREET, BROADHEATH, ALTRINCHAM, CHESHIRE.** ALTrincham 4360.

600

VERTICAL **CONE MILL** by Huxham & Brown, 34 in. diam. by 18 in. deep. fluted grinding cone with renewable wearing plates. Fluted grinding chamber with bagging attach't. Underdriven through bevel gearing F & L pulleys.

MELANGEUR by Lehmann. 6 ft. diam., cast steel construction with 10 in. by 6 in. side outlet. Twin granite rolls 27 in. diam. by 13 in. face underdriven through crown wheel and pinion with bare shaft extension. Ploughs and scrapers mounted on crosshead.

Triple Steel Roll **INCLINED MILL** by Buhler, 31½ in. by 13¾ in. diam. Water cooled rolls, bottom roll offset. Feed hopper and 3 in. diam. spiral cutter.

Pomace **DISINTEGRATOR & BLOWER** by H. Beare. Blower capacity 6/8 tons pressed pomace per hr. Motorized 10 h.p. 400/3/50. Feed trough.

GEORGE COHEN SONS & CO., LTD.
WOOD LANE, LONDON, W.12.
Tel: Shepherds Bush 2070 and
STANNINGLEY, NR. LEEDS.
Tel: Pudsey 2241.

ONE OVAL-SHAPED DISINFECTOR by Manlove & Alliott. Inside measurements, 30 in. by 50 in. high by 7 ft. long, steam jacketed, with hinged door each end. 30 lb. p.s.i. pressure. £80. **THOMPSON & SON (MILLWALL), LTD., LONDON, E.14 (TEL. EAST 1844).**

ONE—S. H. Johnson plate and frame Filter Press, 17 cakes 22½ in. square, bottom side feed, individual side outlet, plates and frames in solid F.D.P. steel, price £650. **BOX NO. C.A. 3429. THE CHEMICAL AGE 154 FLEET STREET, LONDON, E.C.4.**

ONE S. J. WERNER MIXER with pan approx. 2 ft. by 2 ft. of the tilting type.

Two steam jacketed **CAST-IRON FILTER PRESSES**, each with 38 s.j. plates and 39 frames, cake size 2 ft. 4 in. square.

Several Johnson **CAST IRON FILTER PRESSES**—various sizes and types.

GARDNER MIXERS and Mixers and Sifters combined, sizes "E," "G," "H" and "I."

HYDRO EXTRACTORS, 24 in. 30in. and 36 in.

Two 18 in. **KEK PLATE MILLS**, with feeders, delivery bins, motors and entablature.

Two No. 4 **SUPER MIRACLE MILLS** with motors and starters.

Two Single effect **EVAPORATORS** by Scott with pumps and motors.

1 Gardner s.j. **MIXER**, trough 6 ft. by 3ft. by 3ft., complete with motor and reduction gear.

3 Copper Lined s.j. Pans, 60 lbs., pressure.

RICHARD SIZER, LTD., ENGINEERS, HULL.
Tele: 31743

PHONE 98 STAINES

STAINLESS STEEL CYLINDRICAL PANS—175 & 300 gallons.

500-gal. "Lithcote" **JACKETED ENCLOSED VESSEL.**

New 1,000-gal. **GALVANISED ENCLOSED RECTANGULAR TANKS.**

3,350-gal. **ALUMINIUM CYLINDRICAL OPEN TANK.**

SWING HAMMER PULVERISER—20 by 24.

SPIKED ROLL CRUSHERS—18 in. by 12 in.

(30) **"Z" & FIN BLADE MIXERS**—up to 40 in. by 31 in. by 28 in.

(20) **"U"-TROUGH MIXERS & SIFTER/MIXERS**—up to 7 ft. 6 in. by 3 ft. by 3 ft.

PUMPS, HYDROS, AUTOCLAVES, CONDENSERS, BOILERS, REFINERS, CONVEYORS, PANS, etc.

HARRY H. GARDAM & CO., LTD.,
STAINES.

TEFLON! Ask for our price list for Joints, Strips, Rods, Discs, Valves and the newest cloth made of TEFLON. **MACHINERY (CONTINENTAL) LIMITED,** 175, Brompton Road, London S.W.3. Telephone: Kensington 6228 (three lines).

WANTED

INDUSTRIAL BY-PRODUCTS, LTD., 16, Philpot Lane, London, E.C.3, will be pleased to receive particulars of any by-products, waste materials and residues for disposal.

PROCESS SALVAGE, LTD., offer the highest prices obtainable in this country for 40/45-gallon bung type and full aperture **STEEL DRUMS.** We are interested in purchasing any quantities of either type you may have available for disposal and can arrange for cash payments and immediate collections.— Please ring Advance 1676 (four lines) or write **PURCHASING DEPARTMENT, PROCESS SALVAGE, LTD., 79/83 COBORN RD., BOW, LONDON, E.3.**

WORK WANTED & OFFERED

CRUSHING, GRINDING, MIXING and DRYING for the trade.
THE CRACK PULVERISING MILLS LTD
Plantation House,
Mincing Lane,
London, E.C.2.

GRINDING, CRUSHING AND GRADING
FINE GRINDING LTD.,
BLACKHOLE MINE, EYAM
TELEPHONE: EYAM 227

PULVERISING of every description of chemical and other materials for the trade with improved mills, wharfage, and storage facilities. **THOS. HILL-JONES, LTD., "INVICTA" WORKS, BOW COMMON LANE, LONDON, E. TELEGRAMS: "HILL-JONES, BOCHURCH LONDON." TELEPHONE: 3285 EAST.**

AUCTIONEERS, VALUERS, Etc.

EDWARD RUSHTON, SON AND KENYON
(Established 1855).

Auctioneers, Valuers and Fire Loss Assessors of CHEMICAL WORKS PLANT AND MACHINERY
York House, 12 York Street Manchester.

Telephone 1937 (2 lines) Central Manchester.

PATENTS

NOTICE is hereby given that Knapsack-Griesheim, A. G. seek leave to amend the Complete Specification of the Application for Letters Patent No. 729,748 for an invention entitled "**LIQUID ACETYLENE**"

Particulars of the proposed amendments were set forth in the Official Journal (Patents), No. 3474 dated 14th September, 1955.

Any person may give Notice of Opposition to the amendment by leaving Patents Form No. 36 at the **PATENT OFFICE, 25, SOUTHAMPTON BUILDINGS, LONDON, W.C.2,** on or before 14th October, 1955.

INDEX to advertisers in this issue

Printed in Great Britain by THE PRESS AT COOMBELANDS LTD., Addlestone, and published by BENN BROTHERS LTD., at Bouverie House, 154 Fleet Street, E.C.4, 8 October, 1955. Registered at the General Post Office. Entered as Second Class Matter at the New York U.S.A., Post Office.